

AAI AUTOMOTIVE INDUSTRIES

AUTOMOTIVE and AVIATION MANUFACTURING

Civilian and Defense

NOVEMBER 1, 1951

In This Issue . . .

Part I Show Highlights

Dual-Purpose Plants

IHC Proving Ground

Packard Power Braking

Ceramic Coating Tests

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A C H I L T O N P U B L I C A T I O N

What's your problem?



Meet C. P. Smith, lubrication specialist with headquarters at Standard Oil's Grand Rapids office. He's the man who recommended STANICUT Cutting Oil 107 BC to operators of this plant and helped them make important savings in operating costs.

C. P. Smith is one of a corps of able lubrication specialists who are located in Standard offices throughout the Midwest. They have been specially trained in Standard Oil Lubrication Engineering Schools and in addition, have a wealth of on-the-job experience. The specialist nearest your plant is ready to give prompt, expert, thorough attention to your lubrication problems.

It's easy to obtain his services. A phone call to your nearest Standard Oil Company office will bring him quickly to your plant . . . with no obligation to you, of course. Ask him to explain the advantages of such fine products as:

STANICOOL HD Soluble Oil - Because it contains additional compounding, this soluble oil possesses not only the cooling ability of an emulsion but also the ability to give better tool life and finer finishes than can be obtained with a conventional soluble oil.

STANOSTAMP Compounds - Here are three established products for stamping or heavy drawing operations of either low-carbon or alloy steels. Water can be added to these paste compounds to provide the most economical application. STANOSTAMPS offer maximum protection for dies and work. These compounds can be removed readily in conventional washing equipment.



How one cutting oil cuts costs

Production at this Michigan screw machine products plant includes a wide range of parts made of brass, copper, bronze, aluminum, steel, and stainless steel. STANICUT Cutting Oil 107 BC is used across the board.

Adopted on the recommendation of a Standard Oil lubrication specialist, STANICUT has resulted in a consistently fine finish with no troubles from corrosion. And, since it is used for a variety of operations, STANICUT has resulted in simplified stocking of cutting oils and lower costs.

Consider the job STANICUT is doing for this manufacturer. Then ask yourself: "Why use two when one will do?" Perhaps a single grade of STANICUT can replace two or more conventional cutting oils in



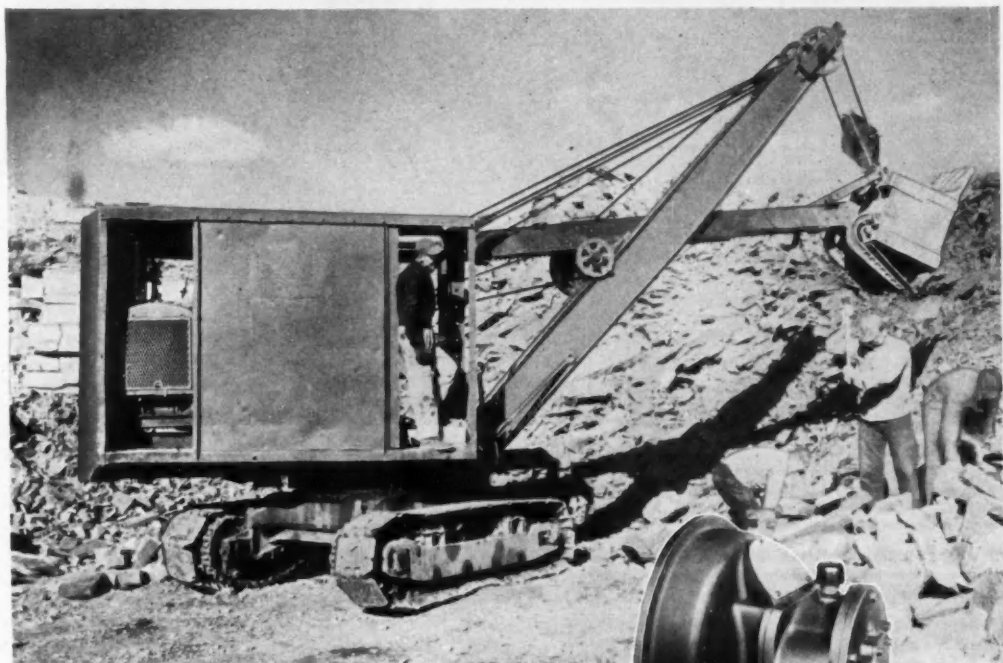
your own plant . . . and help you cut your costs. A call to your local Standard Oil office is all that's necessary to put a lubrication specialist to work on your cutting oil problem. Why not do it today? Standard Oil Company (Indiana), 910 South Michigan Avenue, Chicago 80, Illinois.

STANDARD OIL COMPANY



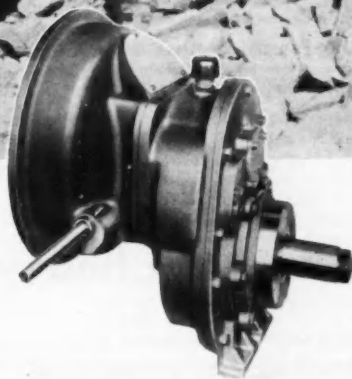
(Indiana)

Rebuilds shovel with new engine and Cotta Reduction Gear



Saves costly replacement

Modernizing a quarry shovel owned by the Montgomery Stone Company of Montgomeryville, Pennsylvania, called for installation of a new gasoline engine. To convert the higher rpm of the new engine to the slower speed of the old operating parts, a Cotta Reduction Unit was specified. The shovel is now in service, ready to dig and load stone for years to come. The owner reports he is "well pleased". If you find new heavy-duty equipment costly and hard to get, perhaps a re-building job is your answer. We shall be glad to give you the benefit of our experience on thousands of speed reduction applications.



Broad range of ratios

Input torque from 150 to 2000
foot pounds

For use on cranes, shovels, rock
crushers, generators, pumps, etc.

THIS INFORMATION WILL HELP YOU

Diagrams, capacity tables, dimensions and complete specifications sent free on request. Just state your problem — COTTA engineers will help you select the right unit for best performance. May we work with you?

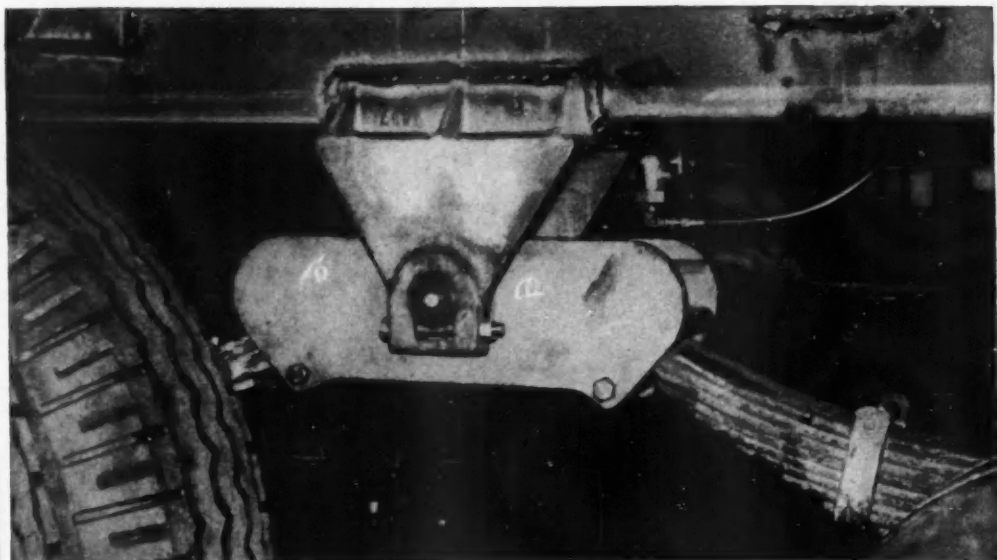
COTTA TRANSMISSION CO., ROCKFORD, ILLINOIS



COTTA

**HEAVY-DUTY
REDUCTION UNITS**

"Engineered-to-order"



THIS ANNEALED DUCTILE IRON spring equalizer combines high strength and wear-resistance along with a remarkable degree of toughness. As a result, this casting assures dependable performance regardless of the heavy shocks and impact loads encountered in service.

TOP VIEW OF DISSEMBLED SPRING EQUALIZER for trailer tandem produced in annealed Ductile Iron by Lufkin Foundry & Machine Company of Lufkin, Texas.



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...for heavy mobile equipment

DUCTILE IRON is a cast ferrous product that combines the *process advantages* of cast iron along with many of the *product advantages* of cast steel.

In less than two years, Ductile Iron has attained wide

acceptance because it offers excellent castability, high mechanical properties, and good machinability. Parts cast in Ductile Iron show superior pressure tightness, good elastic modulus and resistance to shock.

TYPICAL CURRENT APPLICATIONS: Crankshafts, cylinder blocks, pumps, manifolds, anvil blocks for forging hammers, wrenches, valves, and scores of other parts, as-cast, and heat treated.

AVAILABILITY: Send us details of your prospective uses, so that we may offer a list of sources from some 100 authorized foundries now producing Ductile Iron under patent licenses. Request a list of available publications on Ductile Iron... mail the coupon now.



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Dept. AI, 67 Wall Street, New York 5, N. Y.

Please send me a list of publications on: **DUCTILE IRON**

Name..... Title.....
Company.....
Address.....
City..... State.....

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NEW YORK 5, N. Y.

AUTOMOTIVE INDUSTRIES

November 1, 1951

Published Semi-Monthly

Vol. 105, No. 9

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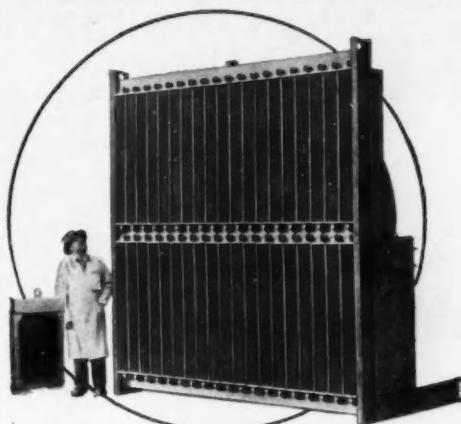
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AUTOMOTIVE INDUSTRIES, November 1, 1951

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WHATEVER the type of machining or the metal being worked, the proper *Texaco Cutting, Grinding or Soluble Oil* keeps the tool sharp longer, prevents metal distortion, chip welding or wheel loading. Greater accuracy and better finish result. Work goes faster, too. You have less scrap, fewer rejects. Production increases.

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tors, conveyors.



Class SS bushed roller
chain with offset sidebars
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Link-Belt "Flint-Rim" cast
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are also available for most
severe service.

Link-Belt offers no single "cure-all" chain to handle every job. From the most complete line of chains and sprockets in the world—we can recommend the *exact* type to fit your particular job requirements—cast, combination, forged and fabricated steel, roller or silent. So, whatever your chain problems, big or small, Link-Belt engineers will work with you or your consultants to help solve them.

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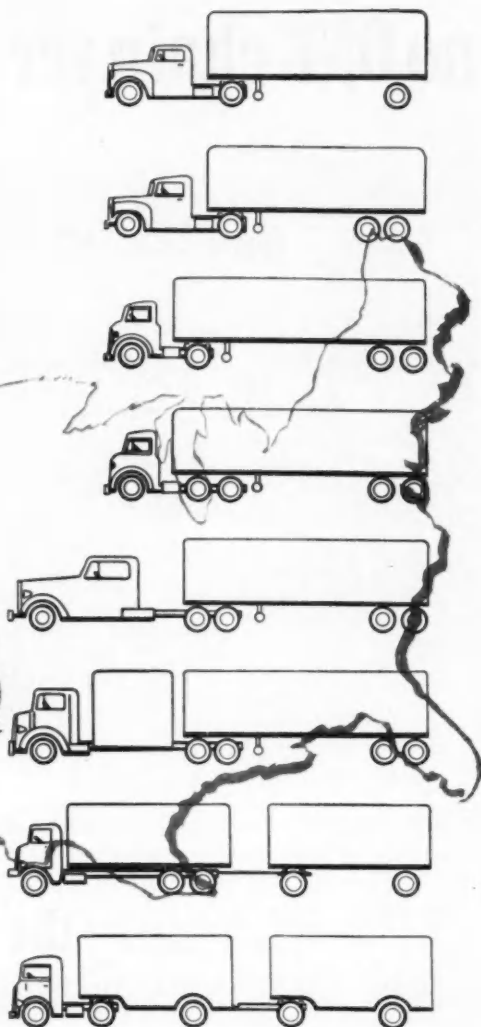
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CHAINS AND SPROCKETS



Popular Combinations



From coast to coast, these are the popular tractor-trailer combinations.* Each has some advantage just right for its service, its locality, the roads it has to travel. Truck, bus and trailer manufacturers know another popular combination—**SKF** Ball and Roller Bearings. They, too, are popular because every **SKF** Bearing has characteristics which make it just the right bearing for the job to be done. Most important, they are popular because the men who design and produce America's trucks, buses and trailers have learned that **SKF**, more than any other bearing manufacturer, has the engineers both at its plants and in the field to help put the right bearing in the right place.

7295



*Commercial Car Journal, August 1951.


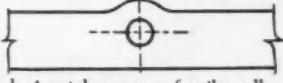

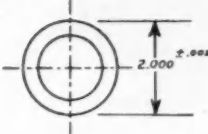
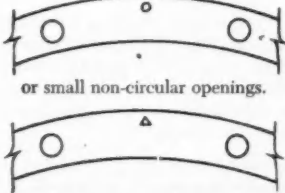



WHY **SKF** IS PREFERRED BY ALL INDUSTRY

Integrity • craftsmanship • metallurgy
tolerance control • surface finish • product uniformity
engineering service • field service

SKF INDUSTRIES, INC., PHILADELPHIA 32, PA.—manufacturers of **SKF** and HESS-BRIGHT bearings.

How to remedy common errors in gasket design

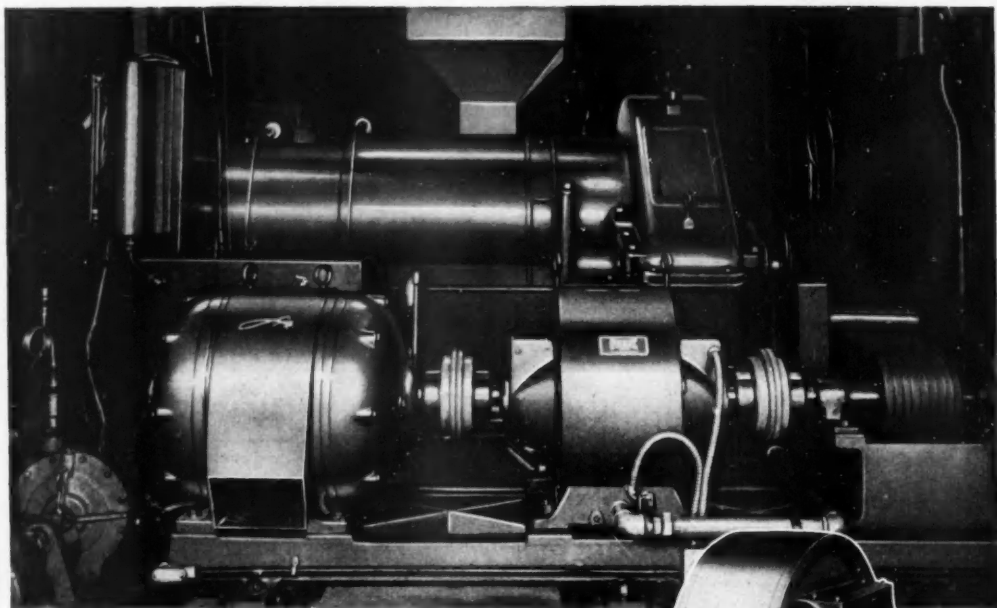
The fault	The reason	The remedy
<p>Bolt holes too close to edge.</p> 	<p>Gaskets so designed are expensive to make as well as expensive to use. They break easily during stripping and center picking and are easily damaged in transit. Often such gaskets also demand careful handling during assembly.</p>	<p>a. An "ear"; strengthens gasket.</p>  <p>b. A notch; removes fragile wall.</p> 
<p>Metal-working tolerances applied to gasket thickness, diameter, length, width, etc.</p> 	<p>Close tolerances involve special dies, extra manufacturing operations, and special sorting and inspection. This delays deliveries and increases costs.</p>	<p>Specify realistic tolerances. In most cases, a resilient gasket is entirely satisfactory if held no closer than $\pm .010$", even on metal parts that must be held to $\pm .002$". Try standard or commercial tolerances before concluding that special accuracy is necessary.</p>
<p>Very small bolt holes . . . or small non-circular openings.</p> 	<p>Centers from such holes probably require hand-picking. Because small holes are easy to miss, extra inspection must be employed. Naturally, this slows down gasket production and increases gasket costs.</p>	<p>Avoid hole sizes under $\frac{3}{32}$" diameter. If hole is for indexing or positioning, it may be possible to change to a small notch.</p> 



You'll find other helpful information on the design and use of gaskets in "Armstrong's Gasket Materials." This 24-page manual discusses subjects such as designing gaskets to reduce cost . . . designing flanges for efficient sealing . . . the effect of surface condition on gaskets, and many others.

You'll find, too, up-to-date information on Armstrong's various sealing and friction materials. Included are government and SAE-ASTM specifications. See this manual in Sweet's file for product designers. For a personal copy, write Armstrong Cork Co., Gaskets and Packings Dept., 1b11 Arch Street, Lancaster, Pennsylvania.

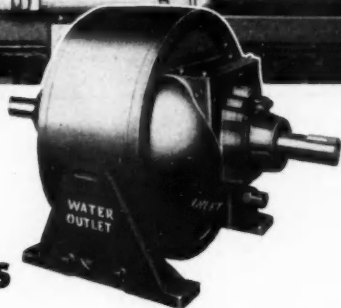
Armstrong's Gasket Materials



Model 6-W Dynamatic Water-Cooled Coupling, driving a No. 8 National wire jacketing extruder from a 100 HP, 1800 RPM cage motor in the plant of a large electrical manufacturing company.

DYNAMATIC
®

**WATER-COOLED
POWER COUPLINGS**



Adjustable Speed Drive from AC Source

- WIDE SPEED RANGE
- INSTANTANEOUS RESPONSE
- ACCURATE SPEED CONTROL
- STEPLESS SPEED ADJUSTMENT
- SMOOTH TORQUE TRANSMISSION
- TOTALLY ENCLOSED
- SIMPLE • QUIET
- COMPACT • EFFICIENT

Dynamatic Water-Cooled Couplings provide adjustable speed drive direct from an AC power source for a wide range of industrial applications. They transmit rotation from a driving to a driven member without mechanical contact, with stepless adjustable control and almost instantaneous response. A simple method of providing adjustable speed from a constant speed source (or vice-versa) with full torque starts.

Effective water-in-the-gap cooling permits large capacity in small space; design provides complete protection against atmospheric impurities.

Standard sizes are available for transmitting torques of 50 pounds feet to approximately 5,000 pounds feet. Units up to 200,000 pounds feet or larger can be built to order.

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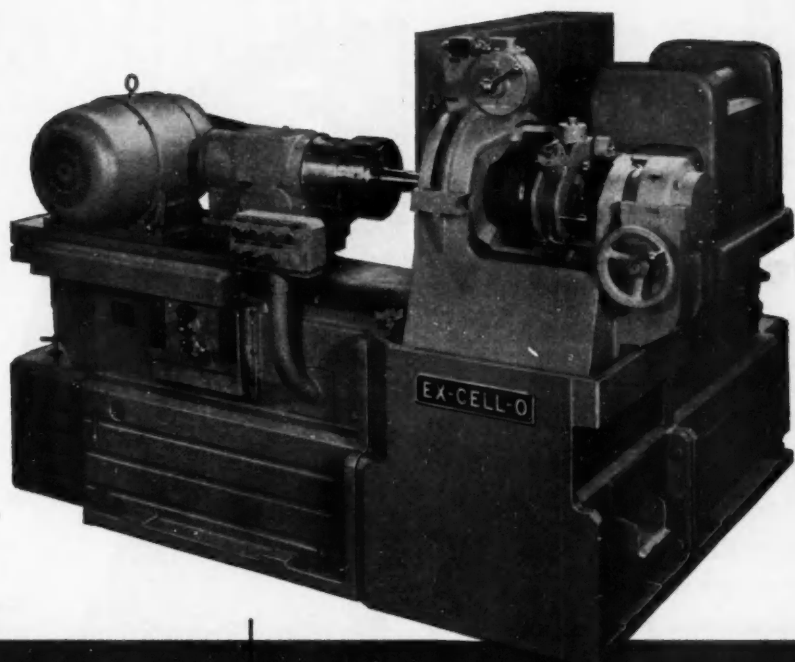
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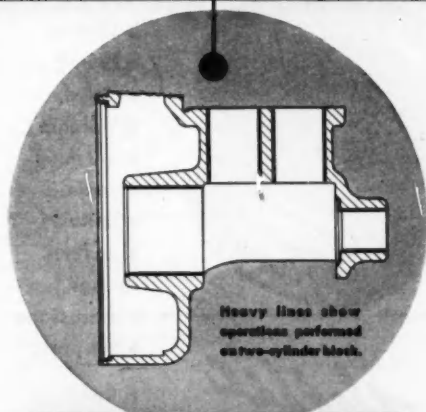
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Ex-Cell-O Two-Way Precision Boring Machine, with fixture that accommodates two- and three-cylinder in-line refrigerator compressor blocks; four- and six-cylinder V-type blocks.



EX-CELL-O



EX - CELL - O

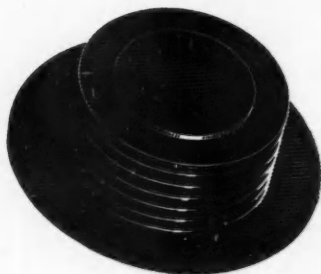
ACCURACY OF 90° ANGLE IS BUILT INTO MACHINE

This Ex-Cell-O Way Machine precision bores cylinders and crankshaft bearings of refrigerator compressor bodies, holding a 90° angle between the bores within .001" in 14". When operations from two directions are performed on one machine the possibility of error in relocating and reclamping the part for each operation is eliminated. Thus the accurate relationship of one operation to another is built into the machine. And of course, doing the operations simultaneously saves time and money too.

Ex-Cell-O Way Type Precision Boring Machines are built up by combining standard way units with a center section and adding tooling to fit the job. Standard way units are economical, self-contained, and can be used over and over again in different combinations. For full information, contact your local Ex-Cell-O representative, or write Ex-Cell-O in Detroit today.

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- seals
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- cut parts

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age, wear,
heat, light



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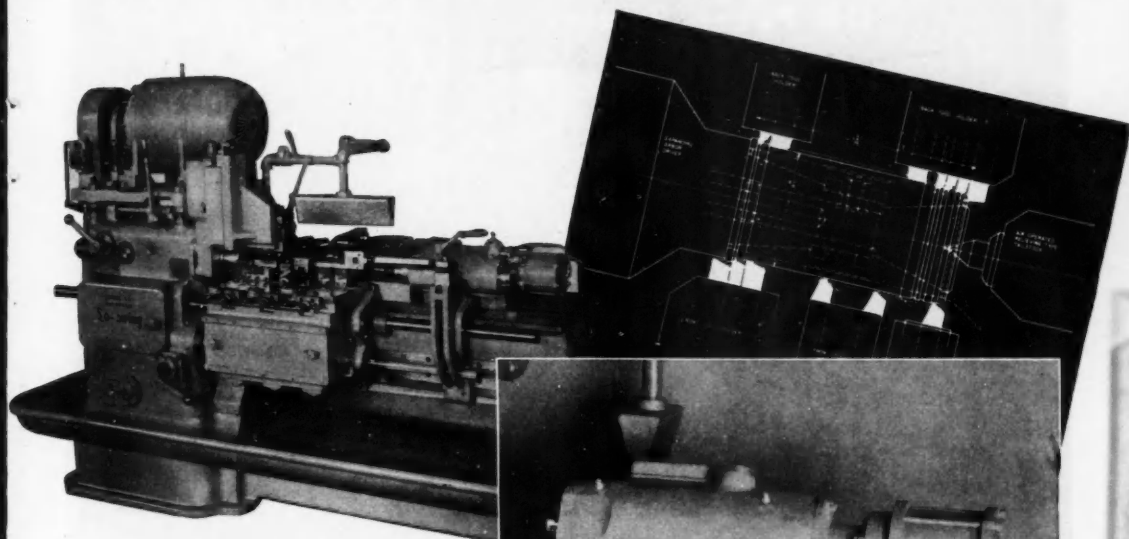
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MACHINE OF THE MONTH

PREPARED BY THE SENECA FALLS MACHINE CO. "THE Lo-swing PEOPLE" SENECA FALLS, NEW YORK



MODEL LR *Lo-swing* **LATHE** **SPEEDS PRODUCTION** **ON CYLINDER LINERS**

Problem: To automatically turn outside diameters, face and groove cast iron Cylinder Liners of various types with Carbide Tools.

Solution: Model LR Lo-swing Automatic Lathe was selected for this job because of its demonstrated fine performance with carbide tools, and its ease of setting-up due to its Simplified Change-Over Mechanism. A Relieving Tailstock which minimizes tailstock spindle overhang, and which facilitates loading and unloading, was incorporated.

The cast iron cylinder liners are delivered to the Lathe with the bore machined to size and the large end faced. They are held and driven with an air-operated, expanding collet arbor which extends the full length of the piece. This large area driving surface permits the high

cutting speeds and coarse carriage feeds required for fast production. Loading of the parts is simplified with the Relieving Type Tailstock, shown in the close-up illustration. Since the driving arbor is bolted to the spindle nose, the operator is relieved of handling heavy stub arbors generally used when work is held between centers. The outside diameters and the short taper on the tailstock end of the liners are turned with six tools mounted on the front slides; all facing and grooving operations are accomplished with tools mounted on the rear slide. The entire operation is automatic—the operator simply loads and unloads the parts and pushes the starting button.

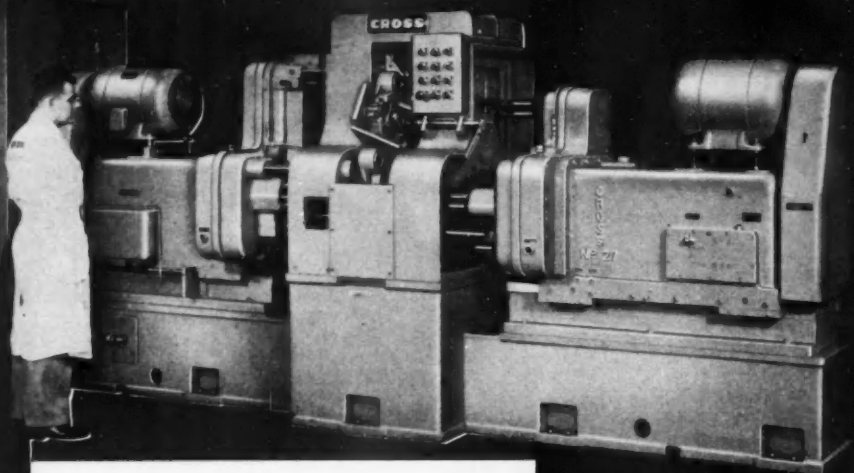
Seneca Falls engineers are at your disposal to assist you with your turning problems.

SENECA FALLS MACHINE CO., SENECA FALLS, N. Y.

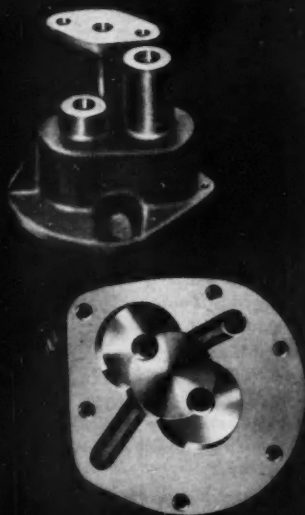
PRODUCTION COSTS ARE LOWER WITH *Lo-swing*

Bores, Drills, Chamfers, Reams Oil Pump Bodies

Another Special by Cross



- ★ 95 oil pump bodies per hour at 100% efficiency.
- ★ Drills and reams shaft holes; rough and semi-bores gear pockets and center counterbore; drills intake hole; drills and chamfers screw holes. (Front and rear faces are machined in previous operation.)
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- ★ Fluid motor drive for indexing.
- ★ Other features: Hydraulic feeds; hardened and ground ways; J.I.C. standard construction; pre-set tools.



Established 1898

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AUTOMOTIVE INDUSTRIES, November 1, 1951

80-27A
13

The Sign OF SMOOTH, SURE STOPS!

THE INDUSTRY'S
FINEST POWER BRAKING SYSTEMS

More than two and a half million installations have made Hydrovac the undisputed leader in the field of power braking. And now Bendix Products offers Air-Pak, an air-hydraulic unit similar in design and principle to the Hydrovac. Air-Pak changes air pressure into hydraulic pressure by means of two direct connected pistons, thus combining all the well proven advantages of hydraulic brake action with an air brake system.

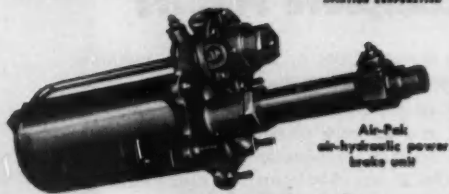
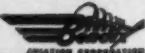
Products of twenty-five years of practical braking experience, these outstanding power braking systems offer faster, more positive and better controlled braking. And in both the vacuum and the air actuated units, brakes can be applied instantly by foot power alone—a safety factor of tremendous importance.

Remember, regardless of size of vehicle or whether your preference is for vacuum or air brakes, for the industry's finest power braking systems be sure to specify Bendix® Hydrovac® or Bendix Air-Pak.

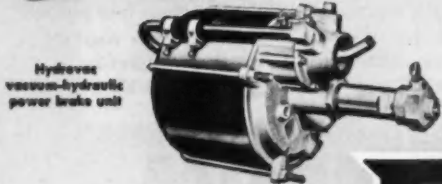
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air-hydraulic power
brake unit



Hydrovac
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power brake unit

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High Spots of This Issue

★ '51 Paris Automobile Show

Held in October, the '51 Paris automobile salon comprised the staging of passenger cars, automobile equipment, and trucks and cycles. French, American, British, German, Italian, Czechoslovakian and Spanish entries were exhibited. See page 34.

★ Dual-Purpose Plants for Preparedness

Here are presented extracts from the address given by Mr. Charles E. Wilson, president of General Motors Corp., at the 33rd meeting of the American Ordnance Association. Layouts of proposed dual-purpose plants are illustrated. Page 38.

★ '52 Packard's Easamatic Power Braking

The Easamatic power brake, operated by engine vacuum, is said to reduce pedal pressure by 40 per cent. Its mechanical details are described and illustrated, page 40.

★ SAE National Aeronautic Meeting

At the four-day affair in Los Angeles recently, the design, production and improvement of aircraft received a thorough airing. This article includes abstracts from three interesting papers presented there. Page 42.

★ Value of Ceramic Coatings

The chief metallurgist at Ryan Aeronautical Co. gives A-1 readers a report on tests made on very thin ceramic coatings as applied to exhaust systems. This laboratory report, complete with photomicrograph illustrations, is found on page 48.

★ New Products Items

And Other High Spots, Such As:

IHC's proving ground at Phoenix, Arizona; a new method for finishing heads of aluminum pistons; machining problems with titanium alloys; Metals; and deburring precision parts by the wet tumbling method.

*News of the Automotive Industries, Page 17
For Complete Table of Contents, See Page 3*

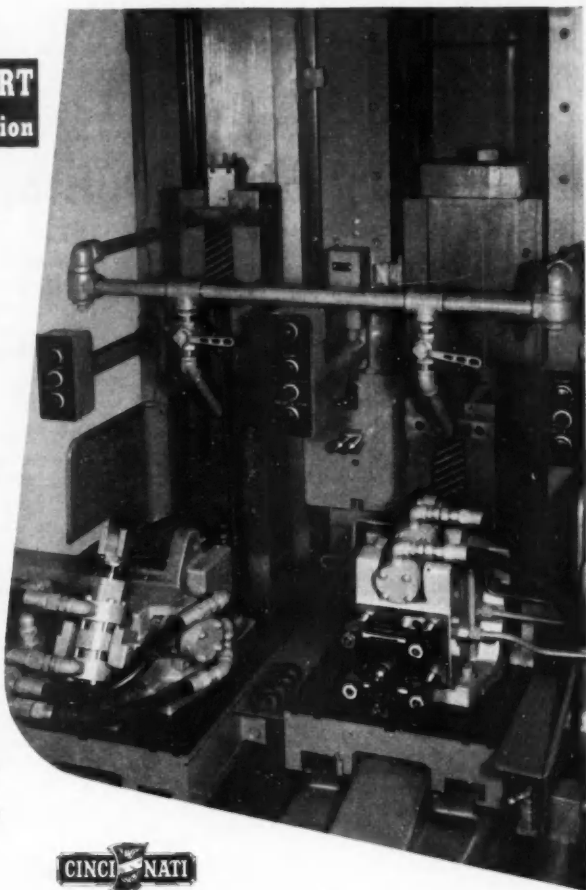
AUTOMOTIVE INDUSTRIES COVERS—
PASSENGER CARS • TRUCKS • BUSES • AIRCRAFT • TRACTORS • ENGINES
• BODIES • TRAILERS • ROAD MACHINERY • FARM MACHINERY •
PARTS AND COMPONENTS • ACCESSORIES • PRODUCTION EQUIPMENT
SERVICE EQUIPMENT • MAINTENANCE EQUIPMENT
ENGINEERING • PRODUCTION • MANAGEMENT

REDUCING PHYSICAL EFFORT

to maintain uniform hourly production

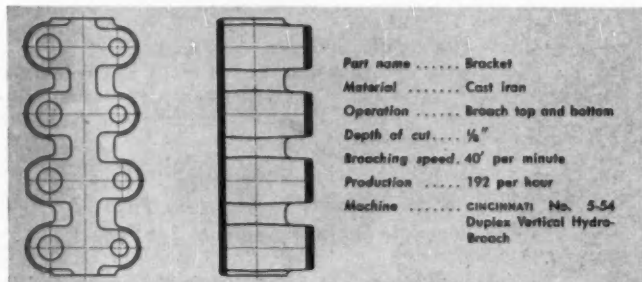
A steady flow of production throughout the day is desirable in any plant. The best way to attain this result is with labor-aiding equipment that reduces or virtually eliminates fatigue. How this was accomplished in broaching cast iron brackets is illustrated here. Cincinnati Application Engineers tooled up a new CINCINNATI No. 5-54 Duplex Vertical Hydro-Broach with two hydraulically operated fixtures. The operator merely positions and removes the work; the fixtures automatically clamp and unclamp in sequence with the advance and retraction of the tables. Of course, the machine contributes a big share toward consistent uniform production. Lubrication of ways and other bearings is automatic, with a measured volume of oil under pressure. Ways are hardened and ground. Hydraulic lines are exceptionally short, promoting smooth cutting. Pre-set cycle control safeguards the operator. Our Application Engineers will be glad to give you their experience in tooling up high priority work for low-cost, uniform production on CINCINNATI Hydro-Broach Machines. If you're not familiar with these efficient production machines, write for literature.

THE CINCINNATI MILLING MACHINE CO.
CINCINNATI 9, OHIO



CINCINNATI

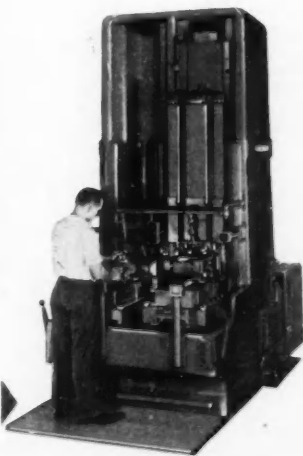
Drawing of part broached on the All-Cincinnati equipment illustrated here. Heavy lines indicate broached surfaces.



CINCINNATI

MILLING MACHINES • CUTTER SHARPENING MACHINES
BROACHING MACHINES • FLAME HARDENING MACHINES
OPTICAL PROJECTION PROFILE GRINDERS • CUTTING FLUID

CINCINNATI No. 10-66 Duplex Vertical Hydro-Broach. Complete specifications in catalog No. M-1719-1.



News of the AUTOMOTIVE INDUSTRIES

Vol. 105, No. 9

November 1, 1951

Willys Confirms Plans for New Passenger Car

Willys-Overland has confirmed that it soon will announce its long expected passenger car. Ward M. Canaday, Willys president, did not give specific details of the car other than to say that it will have all of the luxuries demanded of a car and will be good looking, comfortable, and safe.

Original Equipment Tire Prices Cut

There is at least one bright spot in the cost picture for motor vehicle builders. Without any public announcement or fanfare, large rubber companies supplying original equipment tires have reduced their prices to the manufacturers by from 2½ to 5 per cent. The cut approximately restores price levels in effect last March when tire prices were increased. Replacement tire prices, however, remain unchanged.

Fisher Completes Deal to Build Bullards

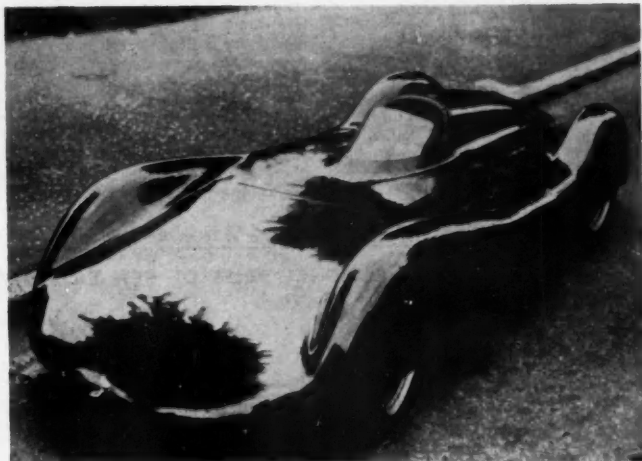
GM's Fisher Body Div. has completed details of its subcontract arrangement with Bullard Co. under which Fisher will build Bullard vertical turret lathes. Assembly of the machine tools will be in Fisher's Pittsburgh plant with seven other Fisher plants furnishing subassemblies. Present plans called for maximum production of 50 units a month.

Ford Sells Station Wagon Body Plant

Ford has sold its Iron Mountain, Mich., station wagon body plant to a group of businessmen. Ford decided sometime ago to dispose of the plant because station wagon body manufacture at that point was no longer economic. Four buildings with nearly one million sq ft of floor space and 2700 acres of land were included in the transaction.

See 950,000 Unit Quota for First Quarter

While as yet there has been no definite official confirmation of passenger car quotas for the first quarter of next year, it is generally believed



TRYING FOR A RECORD

This low midget British racing car was built by racing car builder John Cooper who together with joint-owner Bill Aston plans to take the car to Paris in an attempt to set a new record. The two-cyl automobile has done 140 mph.

that NPA will set the figure at about 950,000, a drop of more than 13 per cent below the present quarter. NPA Administrator Manly Fleischmann stated that the industry probably could build as many as 1,006,000 cars with the allotment of materials scheduled for the first quarter by using materials carried over in inventories from the present quarter and by building smaller cars. The reaction from the industry has been one of skepticism. Officials point out that with chances of building up to the 1.1 million quota this quarter very dubious at present, they can't see where there will be any materials left in inventory to carry over into next year. Furthermore, they say that dies and tooling cannot conveniently be shrunk in size for making smaller automobiles and there is certainly no possibility of retooling for smaller cars.

Materials continue to be extremely tight, with copper the most critical. There have been some recent reports that sheet steel is easing up, but alloys are as tight or tighter than they have ever been. Consequently any freeing of the sheet steel supply is not likely to

have any particular effect so far as making more automobiles is concerned. Meanwhile, strikes in supplier plants are posing something of a threat to continued production even at present rates. The strike at Borg-Warner plants did not have any immediate effect since practically all companies had ample banks of parts on hand, but a continuation of the stoppage beyond 30 days conceivably would close down the industry. The Auto-Lite stoppage also was giving some companies concern, particularly Chrysler. However, shutdowns would not be as serious under present conditions as they would if adequate materials were available, because production can be made up when strikes are settled. At present it looks as though the industry will have trouble meeting its 1.1 million quota this quarter, although it is not expected that it will fall very far short of the mark.

Chrysler Plans to Offer Tinted Glass Option

Chrysler Corp. cars will offer tinted glass as optional equipment on 1952 models. First of the Chrysler new

News of the AUTOMOTIVE

models to appear will be Dodge, which will be shown to the public about mid-November. Currently tinted glass is offered only by three GM divisions, principally Buick, with Cadillac and Oldsmobile offering it to a lesser extent.

Buick Gets \$32 Million for Defense Tooling

The Air Force granted nearly \$63 million in contracts to Michigan and Ohio companies the last week in September. GM's Buick Motor Div. received a contract for \$32 million for machinery and equipment to produce jet engines. Willys-Overland received a \$10 million facilities contract to ex-

Navy, USAF Order New Lockheed Supply Plane

A new convertible military supply plane has been ordered in large quantities from the Lockheed Aircraft Corp. by the U. S. Navy and U. S. Air Force for world air transport of cargo, passengers or battle casualties. The huge triple-duty transports, designed primarily for military cargo purposes, belong to the same four-engined family as Lockheed Constellations and new Super Constellations. They are designated as the Navy R70-1 and Air Force C-121C. Powered by four Wright 3250-hp compound engines, the new plane has a total cargo capacity ranging from about 40,000 to 43,000 lb.

division is moving in steadily. Some machines are stored in the plant, while others are in warehouses around the city. Curtiss is buying a considerable amount of equipment, and a number of machines will be government-owned. Vincent T. Gorguza, general manager of the division, says that rehabilitation and equipment expenditures "will run to quite a few millions" of dollars. Curtiss bought the plant from Otis in August at a price between \$750,000 and \$1 million.

Navy Places Huge Jet Order With Westinghouse

Orders for military jet engines totaling several hundred million dollars

REGIONAL SALES OF NEW PASSENGER CARS

Zone	Region	August 1951	July 1951	August 1950	Eight Months		Per Cent Change		
					1951	1950	August over July	Aug. over Aug. 1950	Eight Months 1951 over 1950
1	New England	24,385	23,167	32,902	210,385	233,979	+ 6.12	-25.42	-10.00
2	Middle Atlantic	69,062	77,286	124,794	701,949	779,554	+15.26	-28.60	- 9.86
3	South Atlantic	45,504	46,539	77,073	429,006	489,535	+ 4.56	-38.55	-12.57
4	East North Central	102,159	108,308	173,345	941,111	1,016,345	- 5.93	-41.07	- 7.40
5	East South Central	20,046	18,823	29,799	186,303	213,556	+ 5.93	-32.73	-21.19
6	West North Central	41,040	41,853	64,485	374,843	427,825	- 2.19	-38.36	-12.32
7	West South Central	38,982	38,561	77,157	316,792	368,673	+ 5.37	-49.60	-18.80
8	Mountain	14,857	14,047	24,493	122,163	146,252	+ 5.98	-39.22	-17.50
9	Pacific	44,617	40,441	79,697	373,961	429,438	+10.82	-43.91	-12.33
Total—United States		424,422	408,333	683,995	3,639,341	4,123,958	+ 4.45	-37.95	-11.75

States comprising the various regions are:—Zone 1: Conn., Me., Mass., N. H., N. J., N. Y., Pa.—Zone 2: Del., D. C., Fla., Ga., Md., N. C., S. C., Va., W. Va.—Zone 3: Ill., Ind., Mich., Ohio, Wis.—Zone 4: Ala., Ky., Miss., Tenn.—Zone 5: Iowa, Kan., Minn., Mo., N. D., S. D.—Zone 6: Ark., La., Okla., Tex.—Zone 7: Ariz., Colo., Ida., Mont., Nev., N. M., Utah, Wyo.—Zone 8: Cal., Ore., Wash.

pand its present steel and aluminum forging capacity at its Toledo plant by 60 per cent. New equipment for producing forgings for jet engines and other aircraft parts will be installed immediately. It includes 20 steam drop hammers, ranging from 5000 to 35,000 lb capacity, several billet furnaces for each hammer, 30 forge and trim presses, and about 100 other miscellaneous items of equipment. Briggs Manufacturing Co. has been awarded a contract for \$5.3 million for machinery and equipment to produce aircraft parts.

Fisher Body to Make Plane Parts for BOP

GM's Fisher Body Div. will undertake production of parts for F-84-F Thunderjet planes in its Grand Rapids, Mich., plant No. 2. Fisher will act as a subcontractor for the BOP division which will build the plane at Kansas City. Clinton Fletcher, manager of Fisher No. 1 plant at Grand Rapids will have general supervision of the plane parts operation.

Navy to Build Missile Plant in Tennessee

A \$25 million plant for guided missile production will be built for the Navy near Bristol, Tenn., by the Sperry Corp. The operating company will be a new subsidiary of Sperry and will be called Sperry Farragut Co.

Curtiss-Wright Rushing Work on Otis Plant

Curtiss-Wright is losing no time in rehabilitating the former Otis Elevator machine shop for its new Metal Processing Div. being set up in Buffalo, N. Y. Work on the plant is being rushed, and the company hopes to have pilot operations underway in the long-idle plant soon after the start of the new year. Workers are fixing up the manufacturing area of the 144,000-sq-ft factory. A new floor will be laid, an extensive and heavy-duty, up-to-date electrical distribution system will be installed, and boilers are being replaced.

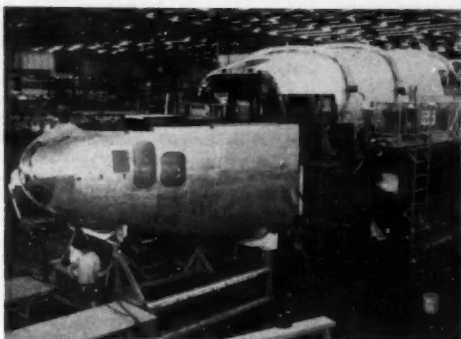
Machinery that will be used by the

have recently been placed by the Navy with the Westinghouse Aviation Gas Turbine Div. Included in the order are quantities of the powerful production jet engine, the Westinghouse J40. Production of pylons for use on the F-84 Thunderjet, made for the U. S. Air Force by Republic Aviation Corp., is now underway at the Westinghouse Electric Appliance Div. plant, Mansfield, O. Concurrently Westinghouse has announced that it will undertake a \$296 million expansion program extending beyond 1953. The expansion program will be the second such program undertaken since the end of World War II. The first, announced in 1945, was completed in 1948 at a cost of approximately \$150 million, and increased manufacturing facilities by 50 per cent.

Plymouth to Assemble Part of Douglas Globemaster

Douglas Aircraft Co., Inc., has signed multi-million dollar contracts with the Plymouth Div. of Chrysler Corp., to assemble the entire tail sec-

INDUSTRIES



NEAR THE END

C-119 Fairchild Flying Boats are shown nearing the final assembly stage at the Kaiser-Frazer Willow Run plant. In addition to normal output of Kaiser and Henry J automobiles, K-F has accepted five major defense contracts to be performed at its Willow Run, Detroit and Dawagiac, Mich., and Oakland and Richmond, Calif., plants.

tion and major wing sections of the C-124 Globemaster II USAF transport airplane. Chrysler has assigned the production to part of the 880,000 sq ft addition being built to its Los Angeles plant. Sections to be produced by Chrysler are currently being manufactured at the Douglas Santa Monica plant for the Long Beach plant, which is the prime contractor.

Navy Jet Helicopter Contract Goes to McDonnell

A contract to build a jet-powered cargo unloader type of helicopter has been awarded to McDonnell Aircraft Corp., St. Louis, Mo., by the Navy. Six manufacturers participated in the design competition which called for a ship-based helicopter capable of transferring heavy equipment to other ships or to combat units ashore under all weather conditions. McDonnell's winning design uses a single, three-bladed rotor driven by small jet engines on the blade tips.

Carboloy Gets Order for Projectiles

The Carboloy Dept. of General Electric Co. has been awarded two contracts by Army Ordnance for armor piercing projectiles. Carboloy still has to complete production on a previous contract.

Army Cargo Vehicle in Production

The Dept. of the Army has disclosed that production has begun on the newest member of the Army's family of vehicles, the M8E2 cargo tractor. Now in production at the Allis-Chalmers plant at LaPorte, Ind., the tractor will be used primarily to tow the 75-mm Skysweeper anti-aircraft gun and other heavy weapons. The new tractor has basically the same chassis as the Wal-

ker Bulldog light tank, and is powered by the Continental air-cooled engine. The 22-ton tractor has a top speed of 40 mph.

Twin Coach Getting More Aircraft Orders

New aircraft orders are being placed with Twin Coach's Cheektowaga (Buffalo, N. Y.) plant as fast as others are completed. Because of the neck-and-neck pace of orders and shipments, the plant's backlog of orders continues to hold at around \$40 million. It has been at that level for about a year.

All the orders are for large airplane wings and parts and helicopter fuse-

lages. Twin Coach is going to put up another plant addition to handle the work. The addition will contain about 19,000 sq ft of space, and will be used principally for storage and as a garage. It will free a similar amount of space in the present plant for manufacturing. The company has 2400 employees.

Budd Gets Order for Tank Parts

The Budd Co. has a subcontract from Chrysler to machine, weld, and paint tank hulls and turrets. A new \$6 million plant is under construction at Philadelphia to house the production job.

Roy Industries Gets Big Jet Subcontract

E. Roy Industries, Ltd., L'Assomption, Quebec, Canada, is tooling for a multi-million dollar sub-contract to build component parts for Canada's new T-33 jet training plane. The company announced that it had been given the job worth "many millions of dollars" by Canadair, Ltd., of Montreal. Canadair has a \$100 million order for the two-place plane that are similar to but less powerful than F-86 Sabres. Edward Roy, company president, said that his plant, 25 miles north of Montreal, probably would increase its working force from 500 to 1200 persons within a year as a result of the order.



ROCKETS AND ENGINES

Oldsmobile-built rockets come down the conveyor lines in two assembly plants at Lansing, Mich. On the left are Oldsmobile high compression Rocket engines being assembled in the Kettering engine plant, which is just celebrating its third anniversary. On the right are 3.5-in. rockets for the Army's super-bazooka coming down a conveyor on their way to the infra-red drying oven after painting.

News of the AUTOMOTIVE



DAY AND NIGHT

De Havilland's latest, the D.H. 110, is a day and night fighter which has just made its maiden flight. Fitted with two Rolls-Royce Avon jet engines, it has the De Havilland twin-boom principle with sharply swept-back wings. No details have been issued regarding performance or armament.

American Helicopter to Open New Facilities

American Helicopter Co., Inc., Manhattan Beach, Calif., will open a new helicopter power plant manufacturing and test facility at Mesa, Ariz., according to Corwin D. Denney, company president. The new facilities, 40,000 sq ft of floor space and 700 acres of adjoining airfield, are to meet the company's backlog of prime contracts for USAF helicopter and pulse-jet power plant work.

Chevrolet to Build Plane Engine Plant

Chevrolet will build a new aviation engine plant at Flint, Mich., adjoining its automobile assembly plant there. The million sq ft plant will be used for production of aircraft engines. Chevrolet currently has under construction an expansion program at Tonawanda, N. Y., comprising one million additional sq ft. The division's contracts are for the 2700 hp Wright Cyclone R-3350-26W and the 3500 hp Wright turbo-compound R-3350-30 W.

Northrop to Build and Operate USAF Flight Center

Northrop Aircraft, Inc., will construct and operate for the USAF a production flight and installation center at the Palmdale, Calif., airport, according to Oliver P. Echols, Northrop board chairman and general manager. The facility is expected to be in operation sometime after mid-1952 and

is expected to provide employment for approximately 500 persons. Scorpion F-89 planes assembled at the company's main plant in Hawthorne will be flown to Palmdale (Los Angeles area) for production flight testing and final installations of equipment.

Northern Ordnance Signs \$30 Million Contract

Northern Ordnance, Inc., operating a Navy-owned plant at Fridley, Minn.,

has signed a \$30 million contract to build a new type of 5-in. gun for the Navy. Production will begin immediately. Addition of this contract brings to \$53 million the money value of Navy orders undertaken by Northern Ordnance. The firm will reactivate certain facilities at the plant, which have been maintained on a standby basis since the end of World War II. Machine tools must be installed, and the number of employees will be doubled.

First Ford Plane Engine Scheduled for March

Ford has set next March as the target date for delivery of its first complete aircraft engine from its plant at Chicago. At present there are about 4200 machine tools of the 6200 required already in the plant and from 600 to 700 subcontractors for various engine parts lined up. Of the approximately 2000 parts required for the engine, about 1800 will be supplied by subcontractors.

GE Building Powerful New Wind Tunnel Drive

What is described as the world's most powerful wind tunnel drive—a 250,000 hp unit capable of creating super-sonic blasts of air—is being constructed in Schenectady, N. Y., by the General Electric Co. Part of an order placed with GE by the National Advisory Committee for Aeronautics, the giant drive will be installed in a new wind tunnel now being built at the

1951 NEW TRUCK REGISTRATIONS*

Arranged by Makes in Descending Order According to the 1951 Eight Months' Totals

MAKE	EIGHT MONTHS							
	August 1951		July 1951		August 1950		Per Cent of Total	
	Units						1951	1950
	1951	1950	1951	1950	1951	1950	1951	1950
Chevrolet.....	32,423	32,403	48,951	248,757	278,744	35.88	36.90	
Ford.....	21,824	20,240	31,239	170,129	207,065	24.74	27.55	
Dodge.....	8,710	8,448	11,771	72,368	68,488	10.52	7.76	
G. M. C.....	8,768	8,310	10,954	68,799	62,839	10.01	8.33	
International.....	8,006	8,885	13,546	61,344	59,529	9.92	9.26	
Studebaker.....	2,923	2,804	4,904	21,087	32,342	3.06	4.29	
Willys Truck.....	1,074	1,044	1,822	10,220	9,644	1.49	1.28	
White.....	883	965	1,173	8,613	7,177	1.25	.95	
Wick.....	894	707	705	7,087	6,081	1.03	.80	
Willys Jeep.....	655	780	916	5,904	5,596	.86	.74	
Diamond T.....	373	363	588	3,285	3,718	.47	.49	
Oliver.....	342	294	459	2,743	2,886	.40	.34	
Reo.....	243	238	369	2,463	2,186	.36	.29	
Brookway.....	181	142	282	1,629	1,404	.24	.19	
Autocar.....	153	171	221	1,485	1,374	.22	.18	
Federal.....	58	62	170	744	933	.11	.12	
Pontiac.....	95	95	116	577	1,140	.08	.15	
Kenworth.....	45	54	47	466	375	.07	.05	
F. W. D.....	37	35	27	325	206	.06	.03	
Sterling.....	28	33	27	247	227	.04	.03	
Peterbilt.....	21	25	21	21003	
Miret Domestic.....	114	94	161	1,000	1,190	.18	.16	
Miret Foreign.....	31	18	23	170	253	.02	.03	
Total—All Makes.....	87,646	84,021	128,533	687,642	754,001	100.00	100.00	

* Based on data from R. L. Polk & Co.

INDUSTRIES

Lewis Flight Propulsion Laboratory in Cleveland, O. The new tunnel will be used to test aircraft power plants in the ramjet, gas turbine and rocket categories.

Allis-Chalmers Gets Most of T-34 Assembly

Allis-Chalmers will do about 90 per cent of the manufacturing operations of T-34 turbo-prop aircraft engines under a subcontract from Pratt & Whitney Aircraft Div. of United Aircraft Corp. Allis-Chalmers will produce and assemble the gas turbine engines at its West Allis, Wis., works, with the engines to be tested by Pratt & Whitney at East Hartford, Conn. A sizable part of the Allis-Chalmers operation will be subcontracted in the Milwaukee area.

Ford of Canada to Build 2000 Military Trucks

Receipt of an order for the assembly of about 2000 quarter-ton military trucks was announced by Rhys M. Sale, president, Ford Motor Co. of Canada, Ltd. The trucks, with four wheel drive, will be produced at the rate of 10 a day beginning in January. Mr. Sale said that the company was glad to have the order, and that it had been under negotiation with Dept. of Defense Production for several months. The order would mean very little from an employment standpoint "other than that every little bit helps," he said. "It is mainly an assembly job and does not involve much in the way of tooling or manufacturing," Mr. Sale said.

Hiller Forms New Jet Research Section

Hiller Helicopters has established a separate new division for research and development in the field of advanced design helicopter jet engines, according to Stanley Hiller, Jr., president. Research and test facilities which were previously used in the development of the company's ram-jet powered Hiller Hornet are being expanded to handle development work for any type of helicopter jet unit, ranging from small engines for single passenger craft to engines for large size transport and troop-carrying helicopters.

Ford and Fisher Order Giant X-Ray Units

Ford and GM's Fisher Body Div. will use giant X-ray machines for inspection work on their tank contracts for the Army. Ford will install a 15 mil-



GROUND TRIALS

Described as Britain's first twin-engined helicopter, the Bristol 173 is shown during its ground running trials at the Bristol factory in England. The plane is designed to carry from 10 to 30 persons or 2500 lb of freight.

lion volt Betatron X-ray machine, the first of its kind in the automobile industry, in its new tank plant currently under construction at Livonia, Mich., just west of Detroit. The unit, which will go into use sometime next year, will have a comparatively large radiation field size, permitting encompassing of large areas of steel in one exposure. The X-ray machine will become more sensitive to flaws as the thickness of the steel increases so that on a 14-in. thickness, flaws as small as .042 in. cross section can be detected.

Fisher has purchased a two million volt X-ray machine for inspection of heavy steel plate used in the new medium tank which the division will produce at the Grand Blanc plant. It is capable of penetrating steel 10 in. thick in 48 minutes from a three-ft distance. It will provide an X-ray speed approximately 78 times greater than that of the one million volt machine, which is the highest voltage in common use in industry today. Electrons are progressively stepped up in voltage or pressure at 24 stations of a multi-section tube until they reach the two million volt level at which time the velocity is about 179,000 miles per second. X-rays may be directed in a stream from the end of the tube in direct head-on inspection or can be directed laterally from the side of the tube in a spray effect, permitting X-raying of many objects arranged in a circle around the machine in one exposure. The unit has a wide exposure

range of 60 degrees, with the useful radiation covering an area of three ft in diameter when the object is exposed at a distance of three ft. Both the Fisher Body and Ford X-ray installations will be made by General Electric Co.

Air Force Tools Offered to Defense Contractors

Manufacturers with defense contracts with the Army and Navy will have an opportunity to lease machine tools owned by the Air Force and in storage depots at Marietta, Ga., and Omaha, Neb. Approximately 5000 machine tools, including gear equipment, grinding machines, and welders with a value of approximately \$80 million will be available for selection by Army and Navy contractors and subcontractors. Previously, manufacturers' holding contracts with the Air Force and the Atomic Energy Commission selected tools from the Air Force pool at the two depots.

Name Gaskill Army Research Deputy

Scientific advice to the Army's Research and Development Div. will be furnished by Dr. Harold V. Gaskill, college professor and author. Dr. Gaskill has been named to the newly-created post of civilian deputy to the chief of R. & D. Iowa State College has given the appointee leave of ab-

News of the AUTOMOTIVE

sence as dean of its division of science and director of the Science Research Institute. While director of War Research at the institution in World War II, he administered a variety of defense scientific contracts in physics, chemistry, and related fields.

International Harvester Testing Trucks at Proving Ground

The motor truck division of International Harvester Co. has announced that full-scale testing of International trucks has begun at the company's

Chrysler to Modify V-8 for Industrial Use

Chrysler is planning to modify its 185 hp V-8 overhead valve engine for use as an industrial power plant. No major internal mechanical changes are contemplated, with the alterations consisting principally of modification of accessories such as fan, governor, and air cleaner. Probably one of the first uses of the industrial engine will be to drive a new air raid siren being built by Chrysler for the Air Force and said to be the most powerful ever built.

reaction time between awareness of the emergency and application of the brakes, since the right foot would not have to be lifted from the accelerator and moved to the brake.

Nash Suspends Assembly at Canadian Plant

A sharp drop in sales in Canada because of severe credit restrictions and taxes imposed by the Canadian government has forced Nash to suspend production temporarily at its Toronto plant. Production will be resumed when the stock of new cars currently on hand is exhausted. Nash has also announced that all production of Rambler automobile bodies has been transferred from the Nash Body Div. plant in Milwaukee to the assembly division plant at Kenosha, Wis. The Milwaukee plant had been building about 80 Rambler bodies a day with the balance of the 275 daily total being produced at Kenosha.

1951 NEW PASSENGER CAR REGISTRATIONS*

Arranged by Makes in Descending Order According to the 1951 Eight Months' Totals

MAKE	August 1951	July 1951	August 1950	EIGHT MONTHS			
				Units		Per Cent of Total	
				1951	1950	1951	1950
Chevrolet	84,627	83,970	147,369	776,199	942,369	21.32	22.86
Ford	72,997	66,096	113,067	626,778	767,632	17.22	19.11
Plymouth	51,042	46,838	71,740	463,275	591,619	11.06	7.07
Buick	30,139	30,735	55,496	281,935	354,983	7.76	8.61
Pontiac	27,506	27,296	45,796	239,672	294,616	6.56	7.14
Dodge	26,744	24,313	43,706	209,036	178,070	5.74	4.25
Oldsmobile	21,467	22,167	37,901	196,647	247,223	5.40	5.99
Mercury	19,896	18,253	29,371	166,563	214,838	4.68	5.21
Studebaker	20,006	15,614	25,626	141,246	197,232	3.66	4.70
Chrysler	11,821	11,851	20,641	110,529	96,220	3.04	2.98
Nash	13,179	11,710	18,147	91,943	127,997	2.53	3.10
De Soto	9,586	9,007	15,631	77,350	65,001	2.13	1.58
Hudson	7,065	6,080	15,435	71,567	104,036	1.87	2.52
Cadillac	6,350	7,622	12,566	67,326	60,414	1.85	1.46
Packard	5,126	5,109	8,536	46,832	48,815	1.29	1.18
Kaiser	3,960	3,969	14,807	38,697	82,300	1.07	1.27
Henry	3,946	3,677	—	38,641	24,054	1.06	—
Willis	2,166	2,535	4,668	18,720	24,054	.51	.58
Lincoln	2,234	1,710	3,570	17,744	23,066	.49	.56
Crosley	476	383	948	3,935	4,907	.11	.12
Frank	—	—	1,106	—	10,726	.26	.10
British Austin	266	214	666	2,237	4,106	.06	.10
British Ford	376	294	262	2,145	1,004	.06	.02
Wolff Domestic	378	266	266	1,622	908	.04	.02
Miscel. Foreign	1,396	1,024	1,396	8,564	4,622	.24	.12
Total—All Makes	424,422	406,333	683,965	3,639,341	4,123,856	100.00	100.00

* Based on data from R. L. Polk & Co.

AMA Facts & Figures Being Distributed

The Automobile Manufacturers Association is now distributing the 31st edition of *Automobile Facts and Figures*, its year book of statistics and information about the automotive industries. It covers such subjects as production of cars, trucks, buses, parts and accessories, tires, batteries, and other automotive items, factory sales, imports and exports, employment, vehicle scrapage figures, automotive taxes, safety and other traffic data, registrations, statistics on vehicles use, and dozens of other items of information. Information published is derived from original research, data received from manufacturers and motor vehicles, government agencies, business associations, domestic and foreign publications, and several foreign governments. Data from more than 100 organizations is represented in *Facts and Figures*.

Industry Supports Study of Materials Handling

Companies in the automotive industries are included among Michigan manufacturers supporting the establishing of a research and training center for materials handling at Wayne University in Detroit. Del S. Harder, Ford vice-president in charge of manufacturing, is honorary chairman of a committee that has been working for the past 18 months on the project. Business and industry will be asked to contribute \$60,000 a year for the next five years to cover about 30 per cent

Power Braking May Alter Pedal Height, Position

With power braking for passenger cars already available on Chrysler Div. models and certain to be extended to other makes, at least the higher priced automobiles, experiments are already underway to reduce the normal brake pedal height. Kelsey-Hayes Wheel Co. which has been supplying vacuum brake booster units to Chrysler since 1946 is experimenting with brake pedal heights of one half or less of the normal six or seven in. currently in use. The objective is to attain reduction in reaction time when the driver lifts his foot from the accelerator to the brake pedal. Kelsey-Hayes also says that in cars with no clutch pedal, evolutionary changes in positioning of the brake pedal for left foot operation offer a distinct possibility for a reduction in

Phoenix Proving Ground, Ariz., following completion of an extensive road construction program. The proving ground, comprising 6½ square miles, features a new 28-ft, 7¼-mile paved test track for trucks, believed to be the biggest paved loop of its kind.

ASTE Industrial Show in Chicago in March '52

The American Society of Tool Engineers Industrial Exposition is to be held in Chicago, March 17 to 21, 1952. Floor plans and details on the show just released by the ASTE, reveal that the five halls comprising the exhibit area at the International Amphitheatre represent a 30 per cent increase in floor space over the largest biennial exposition previously sponsored and operated by the technical society.

INDUSTRIES



BATTERY OF FURNACES

Seen here is one row of a large battery of Hevi Duty electric furnaces installed in the Getty Street plant of Continental Motors Corp., Muskegon, Mich. The furnaces are used for nitriding crankshafts for six- and 12-cyl aircooled military engines. Each furnace holds a group of nine crankshafts loaded vertically on a special truck, the front end of which may be seen projecting from the furnace in this view. The nitriding cycle from start to finish requires a time cycle of 52 hr.

of the cost of establishing a regular four-year course in industrial packaging, materials handling, warehousing, and traffic. When established it will be the first full curriculum course in the country with credits for materials handling management. One of the major problems in establishing such a course of study is to find instructors capable of teaching the science of materials handling. Head of the drive for financial support is Don Kelsey of Union Steel Products Co. He will be assisted by Leonard Reaume of Wayne University with Herbert O. Horning of Chrysler acting as chairman of the sponsoring groups of materials handling societies.

Extend Renegotiation Dates

Firms having fiscal years ending prior to Nov. 30 and which hold government contracts subject to renegotiation now have until March 1, 1952, to file their financial statements with the U. S. Renegotiation Board. Extension of the deadline for filing was granted by Chairman John T. Koehler of the Renegotiation Board.

Director Outlines Aims of Ford Scientific Lab

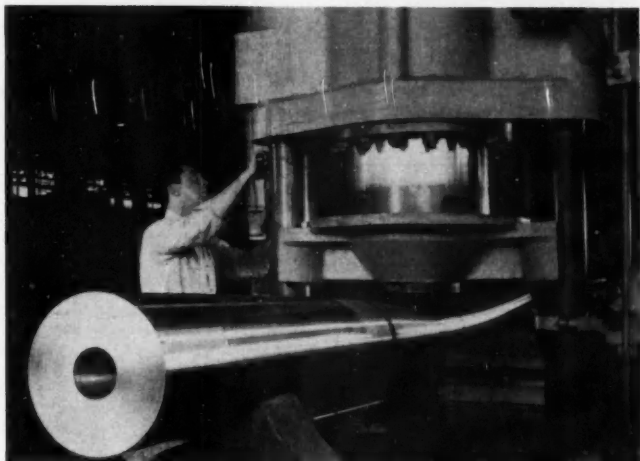
Basic objective of the new Ford Scientific Laboratory will be fundamental research and development in fields broadly related to transportation, according to A. A. Kucher, director of the laboratory. He said that activities

will be disassociated from, but supplementary to, research and engineering work carried on by the company's engineering laboratory. In addition to research dealing with transportation problems, general scientific activities

beyond the scope of automotive research will also be carried on. Engineering classifications into which activities will be divided and the men who will direct each section are as follows: Physics—thermo dynamics, high pressures and high speeds, Don M. McCutcheon, Ford metallurgical engineer; mechanics — physical embodiments, Paul Klotsch, formerly chief engineer of Crosley Motors, Inc.; chemistry—fuels and lubricants, Charles E. Welling, formerly of Phillips Petroleum Co. and Mellon Institute; metallurgy—high temperature materials, Don F. Frey, formerly of the chemical and metallurgical engineering department, University of Michigan; and electronics—for which a manager has not been appointed.

Raybestos-Manhattan Wabash Div. Starts Output

Production in Raybestos-Manhattan's new Wabash Div. has started in a 70,000 sq ft plant, newly-constructed to manufacture sintered metal products for the military defense program. Two units have been built on a 62-acre tract; a main building which contains the manufacturing facilities and administrative offices, and a service building which houses the power plant with boilers, compressors, water softeners and an electric power center.



BENDING IS SIMPLE

Bending 90-millimeter tank cannon is a simple operation for this 400-ton hydraulic press which Firestone Tire & Rubber Co. uses to straighten special alloy tube forgings which warp during machining operations. In this picture, 50,000 lb of pressure put a half-in. bow in the tube to straighten out a slight bend in the high-tensile steel. When the pressure was released, the tube straightened out within the two-thousandths of an inch tolerance prescribed by the Army Ordnance Corps.

News of the AUTOMOTIVE INDUSTRIES

Elect New MEMA Directors

The following have been elected directors of the Motor and Equipment Manufacturers Association for the 1952-1953-1954 term: E. G. Heeren, Permatex Co., Brooklyn, N. Y.; J. H. Humble, Kester Solder Co., Chicago, Ill.; E. J. Muldoon, New Britain Machine Co., New Britain, Conn., and R. D. Pippen, Koppers Co., Baltimore, Md.

General Motors Plans Dual Purpose Plants

GM is already starting to put into practice the principle of "dual purpose" plants advocated by its president, C. E. Wilson, in an address to the American Ordnance Association in Cincinnati recently. A new plant being built at Willow Springs, Ill., for operation by Buick will be designed to produce Sapphire jet engines and large body stampings. GM has also acquired a site at Arlington, Tex., where a large plant is projected for the BOP Div., and if and when the plant is built it will be a dual purpose installation. Nature of the defense work there has not been divulged, but it will probably be some type of aircraft project in addition to its automotive operations.

GM Joins Campaign for Better Roads

GM has joined the growing number of automotive, petroleum, and rubber companies and other interested organizations who are getting behind an aggressive movement to solicit public support behind a program of rehabilitating and modernizing the city and national highway system. GM has pro-

duced a new movie and an accompanying booklet, both entitled *Let's Get Out of the Muddle*. The film and booklet are aimed primarily at a "grass roots" campaign throughout the GM field and dealer organization to acquaint the public with the serious highway congestion problem, its causes and solution.

They outline seven basic points dealing with reasons for deterioration of the highway system including such factors as old age, World War II neglect, inflation, increases in population and spendable income, lack of foresight in highway design, lack of planning to develop city streets to meet current traffic requirements, and unwise spending and diversion of highway funds. It emphasizes particularly that more money must be spent, but it must be spent wisely.

Norton, Behr-Manning Form Export Subsidiary

The formation of a new company to be known as Norton Behr-Manning Overseas, Inc., has been announced by the Norton Co., Worcester, Mass., and Behr-Manning Corp. of Troy, N. Y. The new company will handle all of the export business and direct the subsidiary plant operations of these two corporations throughout the world. Headquarters will be in Worcester with branch offices located in New Rochelle, N. Y., and New York City.

Carboloy Reveals Five New Developments

Carboloy Dept. of General Electric Co. announced development progress of five new products at the World Metallurgical Congress held in Detroit this

week of Oct. 15. Most important to the automotive industries is a new man-made metal called chrome carbide which requires no scarce tungsten or cobalt in its fabrication and which has a high resistance to practically all forms of wear. Carboloy also revealed that it has used tungsten carbide bearings successfully for experimental tests under conditions of excessive speed, load, and temperature. Another Carboloy product announced was a carbide "welding" rod for coating metal parts with a relatively thin skin of extremely hard wear resistant tungsten carbide. Carboloy also revealed that it has in the testing stage a series of metal ceramics which have the unusual property of sharply decreasing resistance to electrical current flow as temperature increases. The fifth Carboloy announcement is that it has added a titanium carbide to its line as an alternate to chrome carbide for high temperature application.

Name Bergstrom Director of NPA's Metalworking Div.

Swan Bergstrom has been named director of the Metalworking Equipment Div. of the National Production Authority. Mr. Bergstrom replaces Harold Tigges, who will return to his position as executive vice president of Baker Bros. of Toledo, O. Mr. Bergstrom is on leave as vice president and director of the Cincinnati Milling Machine Co. of Cincinnati, O.

Ford Holds Previews of Driver Education Films

As a part of its program to promote safe driving, the Ford Motor Co., is holding previews of new driver education films in 18 cities for educators, government officials, and the press. The series, which consists of six motion pictures depicting correct driving techniques under a variety of road conditions, was made with the counsel of a committee of educators appointed by the National Commission on Safety Education of the National Education Association. They will be made available for high school classroom instruction and for showing before civic clubs, church audiences, and other organized groups.

See Tight Battery Supply Ahead

Supplies of new batteries will become increasingly tight, during the next year. Lead supplies are now so critical, control officials say, that a new order may have to be issued which will limit the types, sizes, and ampere-
(Turn to page 76, please)

AVERAGE FLYAWAY COST OF SELECTED PLANES*

Plane—World War II			Plane—Present		Per Cent Increase
AIR FORCE					
Fighter	P-47	\$ 89,000	F-84	\$326,000	266
Fighter	P-51	54,000	F-86	344,000	537
Bomber	B-17	218,000	B-50	1,226,000	371
Bomber	B-29	680,000	B-36	3,500,000	415
Transport	C-47	94,000	C-119	473,000	403
NAVY					
Fighter	F-4-U	102,000	F-7-U	1,140,000	1018
Attack	T-B-M	101,000	A-D	232,000	130
Patrol	P-V	179,000	P-2-V	776,000	334
Patrol	P-B-M	393,000	P-5-M	1,398,000	256

* Defense Production Administration

Present planes above are to perform comparable operational mission to the counterpart in world War II.

Flyaway cost does not include any appreciable quantity of spares.

Present figures are based upon much smaller quantities than World War II. Any substantial increase in individual plane procurements would reduce these average costs, not only because of production short-cuts worked out but also because of broadened bases for amortization of engineering and tooling costs.

Men in the News

Current Personnel Appointments and Changes at Plants of Automotive Manufacturers and Their Suppliers



James H. Ingersoll has been named vice president of the Ingersoll Products Div. of the Borg-Warner Corp.

Robert Barit has been elected vice president in charge of purchasing for the Hudson Motor Car Co.



Bendix Aviation Corp., Bendix Products Div. Two distinct plant sections have been set up: one for aviation products, the other for automotive products. —George W. Pontius III has been named manager of the automotive products section, and Charles D. Manhart manager of the aircraft products section.

Borg-Warner Corp., Ingersoll Products Div.—R. F. Schutz has been appointed assistant treasurer.

Curtiss - Wright Corp. — Paul V. Shields resigned as chairman. Roy T. Hurley, president, was elected to the additional office of chairman. At the board's request Mr. Shields will remain as chairman until Dec. 31. Francis R. O'Leary has been elected vice-president, and W. G. Lundquist a vice-president of the Wright Aeronautical Co.

Ethyl Corp.—Oscar B. Lewis has been elected vice-president of Ethyl Antiknock, Ltd., Canadian subsidiary. He succeeds William M. Turnley who has retired but remains as a director and consultant. James E. Boudreau has been appointed director of public relations of Ethyl Corp.

The Goodyear Tire & Rubber Co. of Canada, Ltd.—Appointment of Henry G. Harper as vice-president in charge of sales has been announced.

American Brake Shoe Co., Brake Shoe & Castings Div.—Edward J. Roesch has been named superintendent of the Meadow Lands, Pa., plant, and Thomas P. Wallace, superintendent of the division's Buffalo, N. Y., plant.

The Firestone Tire & Rubber Co.—Joseph Meek has been named general factory manager of the Memphis, Tenn., plant.

Willis-Overland Motors, Inc.—Harry L. Swan has been appointed advertising and merchandising director, and Don H. Smith, sales promotion manager.

Soss Manufacturing Co.—Andrew TenEyck has been named sales manager.

Packard Motor Car Co.—Clare E. Briggs has been advanced to general sales manager.

The Lincoln Electric Co.—William Irrgang was elected executive vice-president.

Nash-Kelvinator Corp., Nash Motors Div.—Louis F. Hoyt was appointed factory superintendent of the El Segundo, Calif., assembly plant, and Stephen A. Rennells was named chief inspector.

Consolidated Vultee Aircraft Corp.—Quentin G. Turner was appointed manager of the industrial engineering, Guided Missile Div. R. C. Loomis was named manager of the B-36 program, San Diego Div.; P. M. Prophet was named manager of flight; and G. A. Covington was appointed manager of quality control.

Thermoid Co.—Willard H. Allen has been elected to the board of directors.

General Controls Co.—Eldon Burnett has been appointed manager of the newly-opened branch at Omaha, Neb.

Timken Roller Bearing Co.—George T. Humphrey, Jr., has been appointed assistant general manager of the Service Sales Div.

Norton Co.—Frank Zacher was named director of personnel.

Gulf Oil Corp.—R. P. Gilmartin has been appointed chief fuels and lubricants engineer, Equipment Section, Automotive Products Engineering Dept.

National Motor Bearing Co., Inc.—Alf E. Werolin was elected vice-president.

Lincoln Engineering Co., Automotive Div.—R. Warren Gribben has been appointed sales manager.

Menasco Mfg. Co.—Robert D. Cavanaugh and Franklin C. Wolfe have been elected members of the board of directors.

Kaiser Aluminum & Chemical Corp.—Edgar F. Kaiser and William P. B. Marks were elected directors.

Townsend Co.—H. E. Chilcoat was named assistant general sales manager.

E. A. Baumbach Mfg. Co.—Don R. Rose, formerly with the Melrose Park plant of Buick and Western Electric Co., is now sales manager.

American Helicopter Co., Inc.—R. A. Getz has been appointed manager of the company's Mesa, Ariz., plant. W. R. Cunningham is chief power plant engineer and A. C. Thomson is manufacturing superintendent.

Donegal Manufacturing Corp.—Warden F. Wilson has been elected president, general manager, and a director.

Westinghouse Electric Corp.—C. W. Miller has been named manager of Large Power Transformer Engineering for the Transformer Div.

P. R. Mallory & Co., Inc.—Dr. Charles H. Moore has been appointed head of the Metal and Ceramic Div.

Snyder Tool & Engineering Co.—Appointment of William C. Goeckel to the post of assistant sales manager has been announced.

(Turn to page 118, please)

Necrology

John Evon Nelson, 73, former executive vice-president and director of the Gulf Oil Corp., died in Pittsburgh, Pa., Oct. 6.

David L. Johnson, 63, a director of the White Motor Co., died on Oct. 7, in Cleveland, O.

Frederick Bezner, 73, one of the founders of the Hudson Motor Car Co., and the Red Wing Corp., died on Oct. 17 in Norwalk, Conn.

Carlos J. Jolly, 63, head of the department of public legal relations for General Motors Corp., died in Detroit recently.

Donald P. McCredie, 63, chief engineer for the Fleetwood plant of the Fisher Body Div., General Motors Corp., died on Sept. 28, in Detroit, Mich.

Christ W. Fedders, 75, co-inventor of the first water-cooled automobile radiator and former vice-president of the Fedders Manufacturing Co., Inc., died in Buffalo, N. Y., on Sept. 30.

BIG '36' GEAR SHAPER cuts

- The quick assumption that a machine with 36" dia. x 6" face width capacity would not be efficient on small gears... **IS WRONG!**

Here is specific evidence
to the contrary: -----



PHOTO BY COURTESY
NATIONAL ACME COMPANY
CLEVELAND, OHIO
*Making of Multiple Spindle
Bar and Chucking Machines*

GEAR SHAPERS
SHAVING MACHINES
THREAD GENERATORS
CUTTERS AND SHAVING TOOLS
GEAR INSPECTION INSTRUMENTS
PLASTICS MOLDING MACHINES

SMALL GEARS faster, too!

SPECIFICATIONS:

STEEL	SAE 4150
PITCH	8/10
PRESSURE ANGLE	20°
NO. OF TEETH	47
HELIX ANGLE	23°
TOOTH DEPTH	.235"



Cutting Time:

**10 Minutes . . . on the new
36-Type Gear Shaper**

17.2 minutes by next best alternate method
24 minutes on still another machine

(all methods @ 2 gears per load, one cut)

This super-rigid big machine can take heavy cuts at high speed, and still hold fine finish . . . Work can be stacked up to 6" face width. Quick set-up, via shift-lever, dial-set and push-button controls. Choice of 12 cutter spindle speeds (18 to 300 strokes per min.) and 12 rotary feeds . . . The most versatile of all-purpose Gear-shapers! . . . *Contact our nearest representative for additional information. He will be glad to assist you in lowering your gear production costs.*

Fellows

THE FELLOWS GEAR SHAPER COMPANY • Head Office and Export Department • 78 River Street, Springfield, Vermont
Branch Offices: 616 Fisher Bldg., Detroit 2 • 5835 West North Avenue, Chicago 39 • 2206 Empire State Bldg., New York 1

Greater Productivity Plus . . .

. . . increasingly closer tolerances on new products demand better methods. Now is no time to tolerate old machines. Users attribute high production and sustained accuracy to New Britain Precision Boring Machines.

The New Britain-Gridley Machine Division,
The New Britain Machine Company,
New Britain, Conn., U.S.A.

AUTOMATIC BAR AND CHUCKING MACHINES • PRECISION BORING MACHINES
LUCAS HORIZONTAL BORING, DRILLING AND MILLING MACHINES

NEW BRITAIN

Automatics





You Know What You're Getting
...in a Pedigreed Dog, or
a Pedigreed Box

THE SCOTTISH TERRIER of the Scotch Highlands has a longer history than can be traced. His short legs and large head with small ears give an audacious yet friendly appearance. Loyal, active and full of character, the little "Scottie" is very popular today.

• • •

YOU GET the background in your dog's pedigree certificate. But you have to go behind the box maker's certificate to see whether *that* product is truly pedigreed.

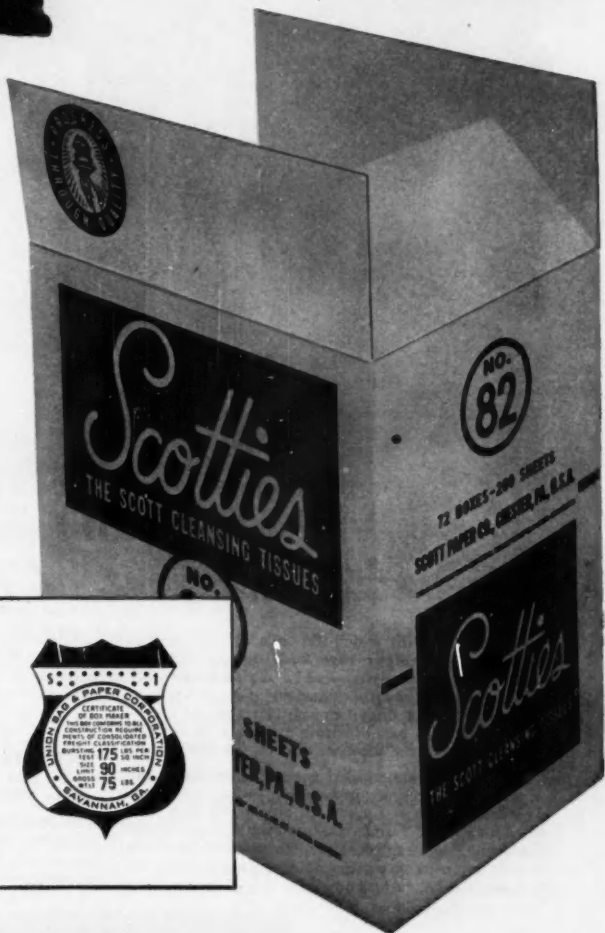
Union's "pedigree" includes the forests of virgin timber—Union-owned and cultivated—the control of every step in manufacture through the world's largest integrated pulp-to-container plant—right through shipping of Union boxes to you.

All this means you can depend on Union boxes for uniformity, car after car, for minimum loss from breakage and fewer returns. You'll agree, as hundreds of America's great names agree, that Union corrugated containers are pedigreed.

For example—Scott Paper Company ships its famous facial tissues in Union's pedigreed boxes.



Dependable Packaging Since 1872



UNION Corrugated Containers

UNION BAG & Paper Corporation

Principal Offices: WOOLWORTH BLDG., NEW YORK 7, N. Y.

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... and it lowers
the ultimate cost of your springs

THE accuracy with which the ends of your springs are finished—whether they are looped, hooked, ground or what have you—can be of vital importance to the assembly and/or operation of your product. Carelessness, poor design or use of improper equipment in this vital part of spring manufacture can add many dollars to the ultimate cost of your springs.

Here at Accurate, skilled springmakers know the importance of accuracy in finishing ends . . . we have the most modern equipment to do the job right and economically . . . and our practical, experienced spring engineers can often recommend modifications in end design to speed assembly of your product or to make it perform better.

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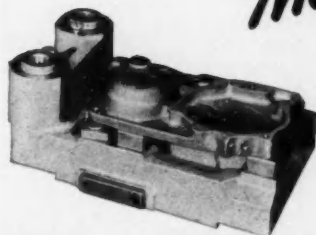
*Be sure the
springs you
buy are
Accurate*



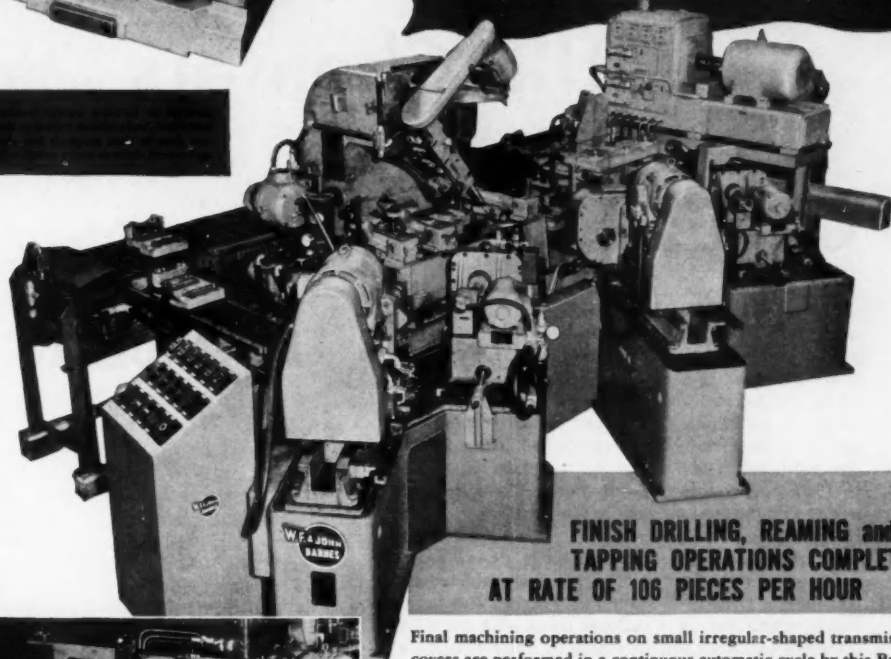
*Springs
Wire Forms
Stampings*

**SMALL IRREGULAR-
SHAPED WORKPIECES**

Machining



BARNES PROGRESS-THRU MACHINE...



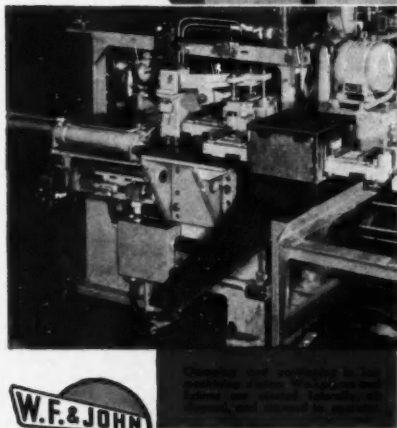
**FINISH DRILLING, REAMING and
TAPPING OPERATIONS COMPLETED
AT RATE OF 106 PIECES PER HOUR**

Final machining operations on small irregular-shaped transmission covers are performed in a continuous automatic cycle by this Barnes 14-Station Progress-Thru Machine. Six drilling, one reaming, and two lead-screw tapping operations are completed at a rate of 106 pieces per hour. In addition, both loading and unloading operations are handled at the first station during the machining cycle.

Workpieces are fed through the machine on special transfer plates and are accurately clamped and positioned to insure precise machining results. After machining, each workpiece and transfer plate is ejected, air cleaned, and returned to the operator at the loading station on a power conveyor. The conveyor is supplied as an integral unit of the machine. Thus, by combining operations, productivity is increased and handling costs are substantially reduced.

ASK FOR ANALYSIS OF YOUR MACHINING METHODS

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Big Cheaters Create Little Cheaters

CORRUPTION in many vicious ramifications has reached dangerous proportions and sunk to the lowest level—the degradation of American youth and the spawning of future criminals.

Fresh in our memories are the recent basketball “fixes” and the organized cheating at our military academy. Daily many youngsters throughout the nation are running afoul of the law.

Much worse has been the shocking evidence turned up by the Senate Committee Investigating Organized Crime in Interstate Commerce. Thousands of teenage children already are narcotic addicts. At one Federal hospital devoted to the treatment of addicts, in 1946 the patients below the age of 21 were three per cent of the total patients in that institution. Today the proportion is 18 per cent.

Equally startling are the wholesale tie-ins among politicians, law enforcing officers and the underworld. Not only is crime well organized in cities and towns, but is syndicated on a national scope with gambling activities and drug peddling reaping many millions of dollars for gangsters and hoodlums, to make them political powers.

This general breakdown has resulted from the lure of “fast” money and laxity in law enforcement—at all levels, from the top to the bottom. Bookmaking, numbers lotteries, drug peddling and other rackets are operated in numerous instances under official sanction. Scandals high in the Federal Government have had their effect down the line and contributed to this widespread disregard for law.

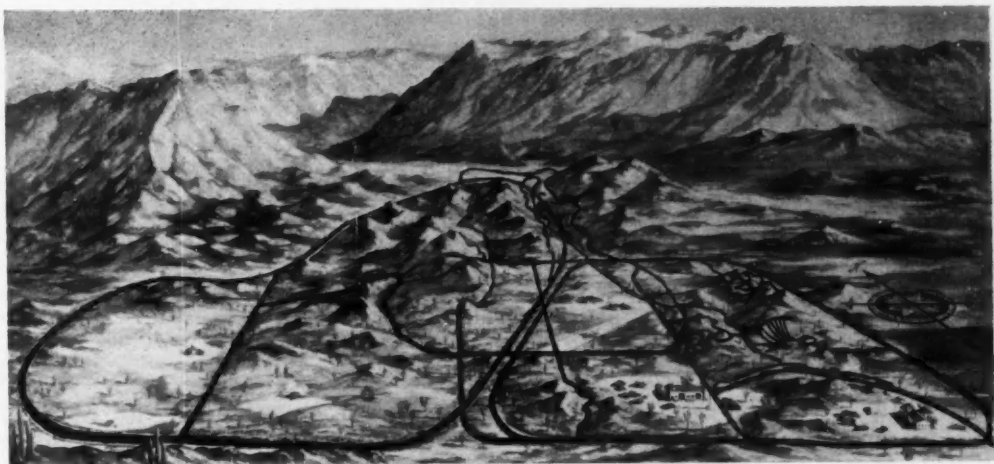
In recent years the nationwide crime operations of the underworld have been thriving on this “fast” money, a product of inflation. As inflation grows little is being done to stop it. Savings, pensions, and the real value of wages dwindle under its pressure. There are pleas for controls, but when enacted, their effectiveness in the long range is nil. Inflation continues its subtle way of stealing both the wealth and freedom of the people.

Thus big cheaters are creating little cheaters until the moral fabric of our Nation is moth-eaten.

AN EDITORIAL

By

James R. Custer



Aerial view of IHC Phoenix Proving Ground with truck test tracks and network of access roads shown in black.

IHC's Proving Ground at Phoenix

AN initial investment of over \$9-million in new engineering research facilities and its Phoenix proving ground was announced by the motor truck division of International Harvester Co., at a meeting of press representatives in Phoenix, Arizona, in October. Over a million dollars already has been expended at Phoenix to launch the new proving ground operation, while at least \$8-million has been budgeted for the engineering and research facilities now nearing completion in Fort Wayne.

One of the primary objectives of the proving ground

is to relieve the truck buyer of the usual service problems incident to the launching of a new truck line—the testing and finding of trouble spots will be done before the vehicle gets into the customer's hands. In the new sales and engineering philosophy development of advanced design features will be handled exclusively in Fort Wayne and finalized to the point of release for manufacturing. Experimental vehicles equipped with such new features then will be transported to Phoenix for extensive road testing and

(Turn to page 84, please)

Wrenching "figure 8" test as being made at new Phoenix Proving Ground of International Harvester Co. Test driver is whipping an International through a series of figure 8's with speed as high as possible. Wheeled outriggers prevent the truck from rolling over as it is being put through double loops hundreds of times during the course of one test.



Production Emphasized at



By W. F. Bradley

Special European Correspondent
for AUTOMOTIVE INDUSTRIES

Bugatti is now in production on its model 101 straight-eight passenger car. The 200 cu in. engine is said to produce 150-hp unsupercharged and 200-hp supercharged. The model pictured is the supercharged version.

COVERING every phase of road transportation, from trucks to bicycles, the Paris automobile salon in October occupied an area of 377,000 sq ft in the Grand Palais, on the Champs Elysees, plus 485,000 sq ft in three halls on the southwestern edge of the city. The layout comprised the staging of passenger

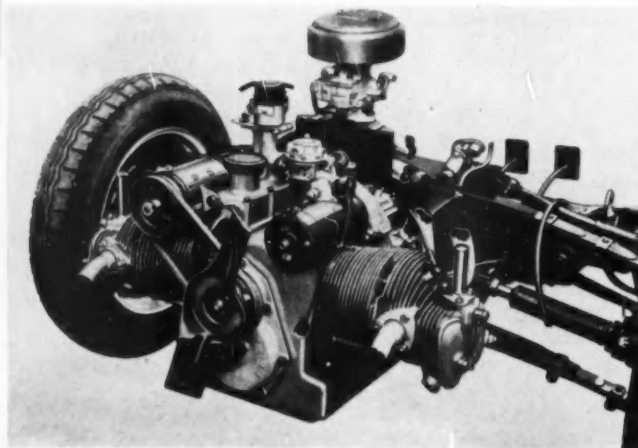
PARIS, FRANCE

cars and automobile equipment in the centrally-located Palais, with trucks and cycles being shown in the remaining buildings.

The American industry this year stole the limelight by reason of the General Motors decision to display the Sabre. This attracted immense crowds of sightseers and choked the surrounding alleyways during demonstration periods.

There were 98 makes of cars and trucks, comprising 37 French, 20 American, 19 British, 13 German, six Italian, two Czechoslovakian, and one Spanish, on exhibition. The French have only an apparent majority because many of them appeared in both passenger car and truck sections. Particularly strong was the equipment division with 600 exhibitors in the automobile and truck sections and 200 in the bicycle and motorcycle division.

Both Paris and London are



Panhard's aircooled flat-twin engine for the Junior model has a bore and stroke of 3.34 in. by 2.95 in. and develops 40 hp.

'51 Paris Automobile Show

This new sports car, the Junior, has been added to the Panhard line.



The low-price Gorman Lloyd passenger car is powered by this two-cyl air-cooled, two-stroke engine which develops about 10 hp.

international selling centers, thus explaining the international aspect of the exhibition. Whereas Britain severely controls sales on the home market, the French authorities give complete selling liberty. Exports are encouraged, but there is no obligation to export. Imports, however, are restricted and subjected to duties which, together with auxiliary taxes, amount to about 65 per cent ad valorem.

Finance Minister Meyer of France took advantage of the show to announce the abolition of price control, which has been in force since the end of the war. This affected only the large production vehicles, makers of high-grade low-volume cars having been left free of price control measures. Already Renault has boosted prices about 14 per cent, the lowest priced rear-engine car now being \$1097. Peugeot has put prices up 10

per cent. Citroen, Panhard and Ford have made no announcement. It is not expected, however, that there will be any change on the Ford passenger car. This is justified on the grounds of higher labor charges and increased cost of steels and other raw materials.

Emphasis this year was on production and not on design. The only entirely new production passenger car in the show was the light-alloy eight-cyl Spanish Pegaso. The Laffly Co., a firm specializing in fire fighting and street cleaning equipment, as well as other special vehicles, exhibited the first

gas turbine truck to be seen in Europe. No claims were made that they are going into immediate production, for only two models have been completed, one undergoing road tests and the other being on exhibition.

Mounted forward, the gas turbine powerplant appears to be of the same general type as the Rover, with two turbines. The primary turbine turns at 30,000 rpm and the secondary at 24,000 rpm at full throttle. There is a first reduction from the secondary turbine to the output shaft, which turns at 2800 rpm. Another housing behind the turbine contains a reverse-gear and emergency reduction gearing. An open drive shaft is used, with a conventional type spur pinion and spiral bevel rear axle. There are two combustion chambers, with the usual spark plug for starting. It is stated that the engine is started up on gasoline, then



The Laffly gas turbine powered truck chassis. Its 190 hp engine weighs only 230 lb. Note air intake at front, mounted just below the chassis frame. (Acme photo.)

run on a mixture of gasoline and fuel oil, and finally on fuel oil only. There are, therefore, two fuel pumps and one injector pump. Fuel consumption is high, being about 0.88 lb per hp-hr, or about twice that of a Diesel. No heat exchanger is used, but it is stated that one is being developed. Air intake is at the front, mounted between the two frame members, and the exhaust is led out, left and right, at the rear. An oil radiator is used. Weight of the powerplant, without any accessories, is stated to be 230 lb. Power output is 190 hp. As the engine cannot be used as a brake, a powerful air brake has been installed on the drive shaft. Air for the brake is supplied by a vertical compressor which is driven off the turbine. As the throttle is closed, this brake comes into action, its effect being to cause the initial slow down, as would be obtained with a reciprocating engine. The chassis has a 10-ton load capacity. With the low position of the engine, forward, and below the top of the side rails, the chassis is said to be particularly suitable for bus service.

Panhard announced the adoption of a four-speed mechanical automatic transmission built under Kreis license, which will be optional equipment on their Dyna model at an extra charge of about \$200. While the Kreis automatic transmission has been before the industry for some time, this appears to be its first commercial application, and Panhard is the first European manufacturer to break away from the manually operated to a completely automatic transmission.

Panhard is holding to practically one type of passenger car, with a flat twin aircooled engine embodying much light alloy, which gives the Panhard cars the most favorable powerweight ratio in Europe. A development of the program is the Junior two-passenger sports car. It uses a production Panhard engine with the cylinder dimensions increased to 3.34 in. by 2.95 in. bore and stroke, giving an output of 40 hp.

With the exception of the Kreis, no automatic transmission has been adopted by a European manufacturer. Zahnradfabrik, of Friedrichshafen, Germany, exhibited a magnetically controlled six-speed transmission, specially designed for trucks and coaches, of the constant-mesh type, with electrically operated multiple disk clutches. Gear changes are made by push buttons. This is in use on a certain number of German coaches. Designed for engines up to 130 hp at 2000 rpm, it weighs 550 lb.

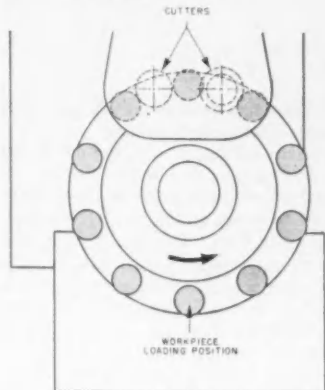
Bugatti, having been more severely damaged than any others during the war, has just come on the market with the model 101, a straight eight of 200 cu in. piston displacement, supplied either with or without supercharger. This is the direct successor to the pre-war model 57 and has many of its features. Two overhead camshafts are used; there are two valves per cylinder with the spark plug placed centrally in the head. The supercharged model develops 200 hp, with a total weight of 3520 lb for the open six-seater, and 150 hp is obtained from the non-supercharged engine. A Bugatti completely machined tubular front axle is used; springs are half-elliptic in front and reversed quarter-elliptics at the rear. The transmission gives four ratios, but a five-speed unit, with overdrive, is being prepared. This automobile will be followed by a four cyl car coming into the lower price range.

A confirmed tendency, particularly among French and Italian manufacturers, is integral chassis-body construction. Originally adopted by Citroen, it has been taken up by Renault, Peugeot, Simca, Lancia, Fiat, Alfa-Romeo and Pegaso. In France the only large producer with separate chassis and body (the latter of all-steel welded construction) is Ford.

Germany does not show much tendency to follow this move, preferring either the central backbone, or closely-set siderails of oval section, with outriders, as

(Turn to page 90, please)

The roughing cutter, on the right-hand side of the cutting head, has two diameters—one for removing the nubbin while the other takes the roughing cut. Finish milling is done by the left-hand cutter.



Pistons are loaded and removed by hand in the 10-station work fixture. Clamping and unclamping of the work in the fixture is done automatically.

New Method for Finishing Heads of Aluminum Pistons

AMETHOD has recently been developed by Studebaker Corp. and Cincinnati Milling and Grinding Machines, Inc., for milling off the nubbin and finishing the heads of aluminum pistons used for the Studebaker V8 engine. Only one machine, a Cincinnati rotary milling unit, is required for this application to meet the current production of V8 engines.

Work is loaded and removed by hand, but automatically clamped and unclamped in a 10 station fixture on a 30 in. rotary table. The clamping arrangement is cam operated with a pair of clamping arms, actuated by a heavy spring, for each piston. To maintain consistent accuracy, the piston pin hole is used as the primary point for locating the pistons in the fixture.

The work table rotates at a speed of 1.35 rpm, which is equivalent to a median feed rate of 85 ipm or a production rate of about 800 pistons per hour. A one-hp, right angle, single reduction gear motor powers the table through a drive consisting of a large diameter worm wheel, fastened to the underside of the table, and a chain from motor to worm shaft.

Two cutters are used in the cutting head. As the pistons pass under the cutters, the nubbin is removed and the head surface is roughed and finished. The line drawing illustration shows the arrangement of the roughing and finishing cutters. The roughing cutter has two diameters, one for removing the nubbin while the other takes the roughing cut on the head of the piston. Both cutter spindles have a slight toe-in to avoid cutter drag.

Power for the spindles is provided by a three hp motor which drives the spindles through vee belts—two belts per spindle. The spindles are driven at a fixed speed of 1500 rpm for the roughing cutter and 2400 rpm for the finishing cutter. Both cutters are five-in. diam and have 12 blades of sintered carbide. Sheaves on the spindles have an extra measure of metal to provide a flywheel effect.

Setup elements consist of a quill adjustment for the spindles, an external positive stop for the ram hand-wheel, and a hand crank for adjusting the rotary position of the table.

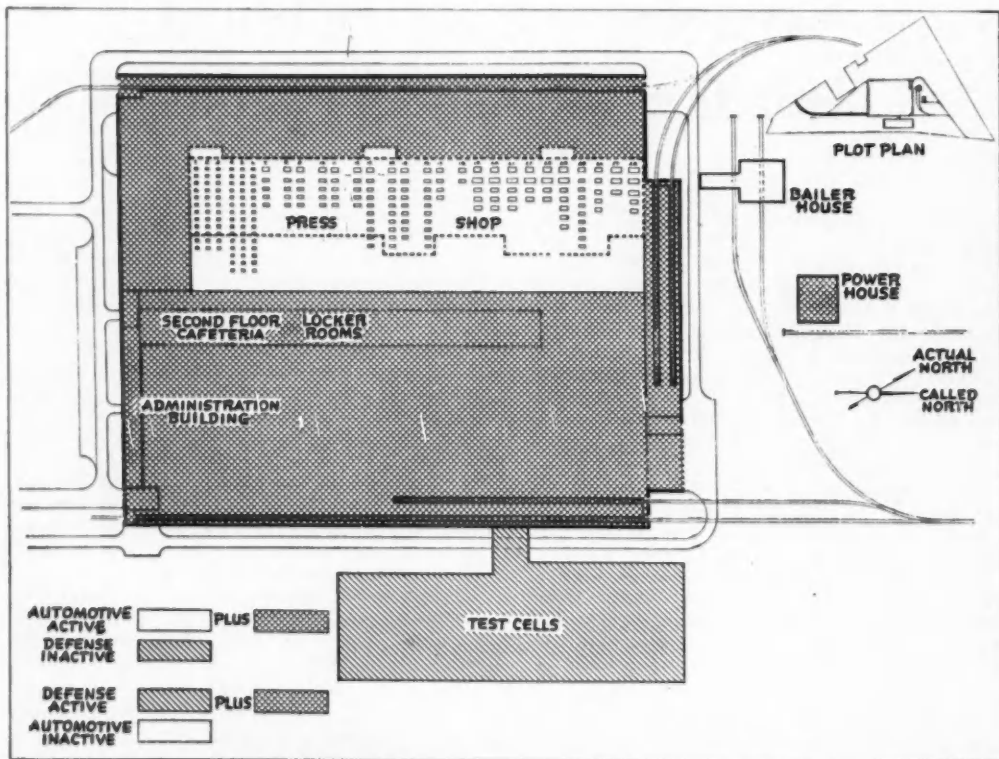
Dual-Purpose Plants for

OUR type of government promotes the initiative of the millions, not the dictatorship of the few. It has produced an ideal environment for the rapid development of natural resources, and the exploitation of marvelous new scientific discoveries and inventions. Americans through the use of mechanical horsepower and machines have substituted slaves of iron and steel for human backs, and through better organization and cooperation in the use of machines have accomplished

much more with the same amount of human effort than have the people of any other nation.

We have never been a military nation, but due to our great industrial development and the initiative and spirit of our people we can have great military power when we are forced to organize and use it. We have proven this in two world wars. However, during most of the 175 years of our country's existence we have spent a relatively small amount of the nation's wealth for arms or standing armies. This contributed importantly to the rapid development of the country, since the nation did not continually have to carry such a non-productive load. During the last fifty years science and invention in the fields of transportation and communication have made the world relatively

Layout of proposed dual-purpose plant for the production of jet engines and of automobile body stampings. That part of the plant is white would be usable for automotive manufacturing only, that part in diagonal lines would be usable for defense production only, and the cross-hatched section usable for either defense or automotive manufacturing.



Preparedness

By Charles E. Wilson

President, General Motors Corp.

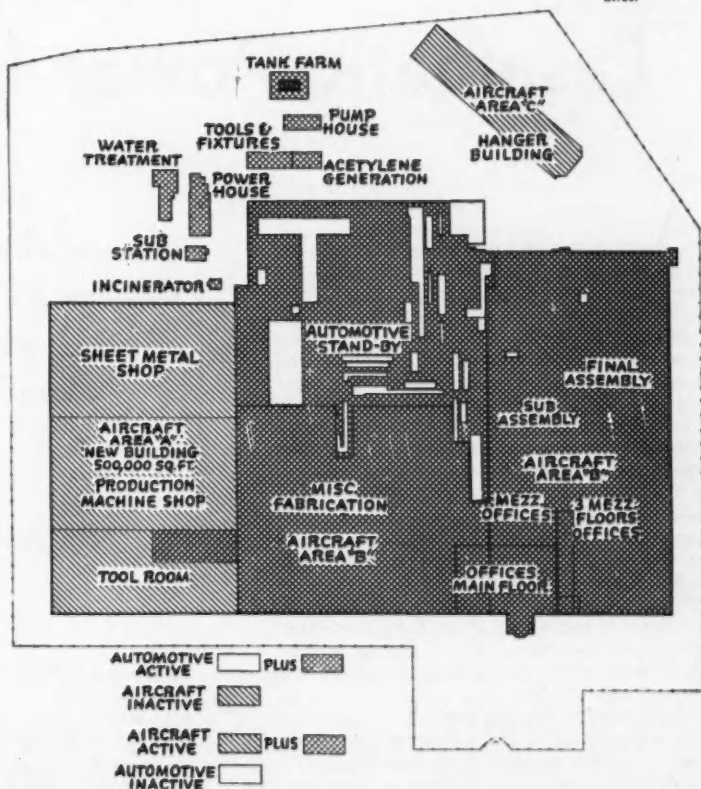
very much smaller. During this same period the increasing wealth and resources of our nation have made our world responsibilities relatively greater.

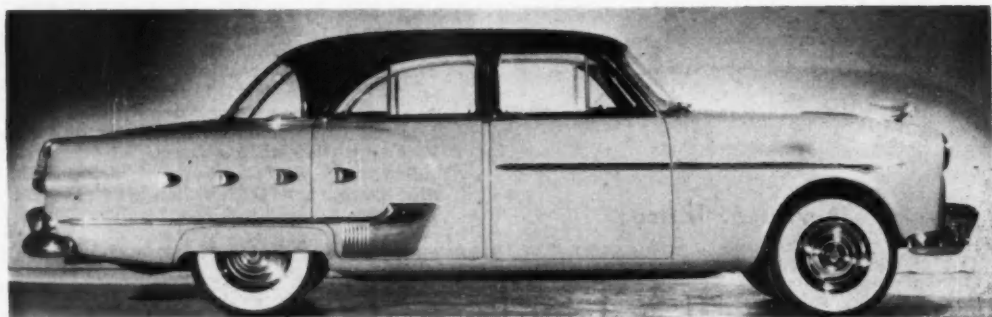
Americans want peace, not war. They want peace with a stable economy and an ever improving standard of living for all the people. The country was founded to promote the life, liberty and pursuit of happiness of its citizens, not for the military or imperialistic aggrandizement of the nation, nor the development of superior power to be aggressively used to the detriment of others. The problem that now confronts us is how best to promote world peace, maintain and preserve a strong and virile economy, and at the same time keep the nation in a position to successfully fight a war in the event war is forced upon us. In solving this problem we must preserve the flexibility and initiative of our American free competitive society and must adhere to the principles that have made our country great. Only in this way will we be able to carry the defense burden. In the immediate future without undermining our national economy. And if we are fortunate enough not to have another all-out war, we can soon again make rapid progress in improving our standard of living.

A defense program on a grand scale, and it must be on a relatively grand scale if it is to be effective, is a great load to (Turn to page 94, please)

THIS article presents extracts from the address given by Mr. Wilson at the 33rd annual meeting of the American Ordnance Association October 4 in Cincinnati, Ohio, with several thousand representatives from industry and the Armed Services in attendance. Previously Mr. Wilson was awarded the Charles L. Harrison Gold Medal of the Cincinnati AOA Post for distinguished ordnance service. Presiding was Louis Polk, president of the Sheffield Corp., and the citation was read by Frederick V. Geier, president of The Cincinnati Milling Machine Co. Presentation of the medal was made by Harvey C. Knowles, vice president, The Procter & Gamble Co. Sessions earlier that day were devoted to aircraft armament developments and industrial preparedness. On October 5 the AOA held an air power session at Wright-Patterson Air Force Base, Dayton, during which the USAF demonstrated its latest aircraft, jet engines, guided missiles, and other special equipment.

Layout of proposed dual-purpose plant for assembly of airplanes and automobiles.





View of the 1952 Packard series "400" four-door sedan showing the change in molding, louvers, and hood ornament. Other exterior design changes include a more massive grille and bumper treatment.

'52 Packard Features Easamatic Power Braking

ALTHOUGH 1952 Packard models remain unchanged in basic styling and sheet metal, they have many mechanical changes and improvements designed for greater durability and increased driver satisfaction. From a mechanical standpoint the most important feature is the power brake, offered as optional equipment. Packard's Easamatic, as it is called, is supplied by Bendix and represents about two years of co-operative engineering designed to provide some exceptional operational characteristics.

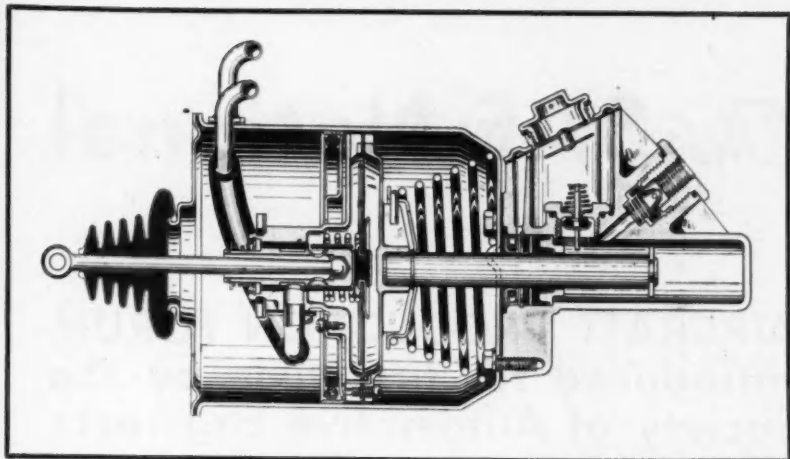
From the standpoint of styling Packard boasts color treatment and interior styling by Dorothy Draper, one of the foremost women decorators in America. Packard will offer a choice of eleven colors and two-toning of up to 20 per cent of 1952 models. One of the striking new colors to be offered in this line is Ebony Gold, a jet black finish with suspended metallic pigment giving the effect of shimmering gold, credited to the work of Packard metallurgists.

Based upon continued research in the laboratory and in the field, Ultramatic drive has been treated to some extensive mechanical changes designed to improve performance, provide smoother operation and,

Ultramatic Transmission Performance Improved Through Extensive Design Changes to the Direct Drive Clutch, Aluminum Turbine Member, and the Planetary Assembly

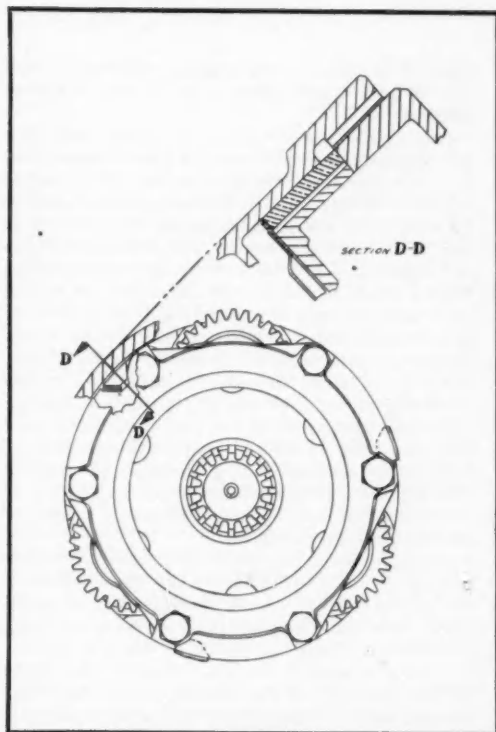
By Joseph Geschelin

in general, to make the drive even more pleasing to the owner. One of the major changes is the adoption of a new direct drive clutch of only 9-in. diam. Significance of this change may be appreciated from the fact that the clutch originally was 11¾-in. diam and more recently 11¼ in.



Left—Cross section of the Bendix vacuum booster used with Packard's Easamatic power braking attachment which is offered as optional equipment on 1952 models. The master cylinder for the hydraulic brake system is mounted on the right. Note the addition of a compensating valve—a spring-loaded valve mounted vertically—within the master cylinder.

Lower left — This line drawing of the new planetary design shows the addition of a damper to eliminate backlash. The damper consists of three equally-spaced wedges of sintered metal mounted between the cage and reverse gear.



Exterior treatment of the new cars has been given some minor touches such as new moldings, new louvers, more massive grille and bumper treatment, and changes in emblems and hood ornaments on various models. Rear license plate lights have been added on the "200" models as well. Rear door arm rests are

available on standard models at extra cost. Door locks and the trunk lock have been improved.

Coming to mechanical features, the Easamatic power brake, operated by engine vacuum, is said to reduce pedal pressure by 40 per cent and is so simple in operation as to cut driver reaction lag an average of 29 per cent. On the other hand, Packard has retained enough pedal resistance to give the driver a definite feel of the brake. This feel is effected by the introduction of a small vacuum diaphragm.

As illustrated, the booster is mounted as an integral unit with the master cylinder of the hydraulic brake system. The latter differs from the conventional by the addition of a compensating valve—a spring-loaded valve mounted vertically within the master cylinder. Another special feature of the system is the provision of a vacuum reserve tank to assure at least three full stops in the event of engine stoppage. The Bendix booster attachment is mounted directly on the toe board.

Unlike conventional brake pedal hook-ups, the Easamatic is actuated by a treadle-mounted pedal only $4\frac{3}{8}$ in. from the floor and so located with respect to the accelerator as to make it possible for the driver to pivot his foot from the accelerator to the brake pedal.

Adoption of the smaller—9 in.—direct drive clutch for Ultramatic drive, together with related changes, has brought about a weight reduction of about four lb. It made necessary a change in the cross-section of the aluminum turbine member, a change in the clutch housing and changes in the operating piston and pressure plate. Salutory effects stemming from the new clutch include softer action, less drag, and a marked improvement in kick-

(Turn to page 104, please)

The SAE National

AIRCRAFT PRODUCTION FORUM introduced for first time by the Society of Automotive Engineers

DESIGN, production and improvement of aircraft had a thorough airing at the four day SAE National Aeronautic Meeting in Los Angeles recently. A highlight of this year's meeting was the Aircraft Production Forum—the first SAE ever held. Nine panels covering machining, forming, processing, production control, tooling development, plant engineering and layout, inspection, labor costs, and electronics were conducted by specialists in their respective fields. Interest was so keen that many panels had standing room only and ran overtime. Opinion ran high for the continuance of this type of meeting.

Much praise for the success of the four day conclave should go to Consolidated Vultee's chief engineer, Frank W. Fink, general chairman of the meeting.

General design aspects of turboprop and turbojet aircraft fuel systems were discussed by C. Stewart Brandt, Consolidated Vultee Aircraft Corp. His paper described some of the problems encountered in the design of fuel systems for turbine engined type aircraft. It highlighted the general industry-wide trend in management thinking and its attitude toward fuel system design, the tremendous increase in manpower demands to design and prove out a satisfactory fuel system for a particular airplane type, the time limitations, and the self-imposed limitations that color the designer's thinking and his attack for finding suitable solutions.

It outlined the difficulties experienced in attempting to handle various fuels in the airplane from the standpoint of vapor locking, vapor losses at high altitudes, slugging and flaming effects, corrosive and electrolytic actions, etc. Lack of storage space, hazards of storing fuel in and around power plant areas, distribution system design difficulties, filtration problems, explosion and fire suppression, system instrumentation experiences, fuel measuring techniques and gadgetry required for automatic center of gravity control were reviewed. Furthermore, the general lack of fundamental knowledge concerning fuels and their actions, hydraulic

analysis methods, hammer-knock phenomena, and lack of good, experimental pressure drop data were described.

It is Brandt's belief that many of these difficulties can be alleviated by concentrated basic research, and in addition, certain recommendations were suggested to aid in solving some of the problems encountered. In the main, these recommendations consist of the use of high velocity fuel systems to aid in reducing line sizes and installation weight, a thorough exploration of hammer-knock phenomena, the use of low vapor pressure fuels to reduce vapor losses and locking tendencies, airframe industry representation on any boards that are responsible for fuel selection, the use of mass rather than volume methods for refueling aircraft, possible development of new fuel quantity measuring apparatus, development of standard laboratory testing techniques, new means of testing system mock-ups (perhaps by electronic analog computer, or electrical "bread board") before actual flight tests, and a concentrated effort to eliminate gadgetry and simplify the systems in future aircraft.

Airplanes now on the drawing boards will fly so fast that they must be built of new materials to withstand the external and internal heat generated by high speed. Titanium has the characteristics required to overcome this threatened heat barrier. O. A. Wheelon, production design engineer, Douglas Aircraft Co., Santa Monica Division, told the meeting in his paper, "Design and Manufacturing Techniques With Titanium." The principal value of titanium in aircraft building is that it provides the strength of steel at nearly half the weight.

Whealon discussed the importance of "aerodynamic heating" in modern airplane design. He said that the heat created by friction of the airplane skin with the air could become critical, especially when added to the heat of structure exposed to the high temperatures of jet and rocket engines. Aluminum loses strength as temperatures rise, but is safe for most purposes to

Aeronautic Meeting

By
**R. Raymond
Kay**

300 F. Between 300 F and 800 F, titanium and its alloys have considerable strength-weight advantages over the stainless steels formerly used in this temperature range.

"We recently found," Wheelon said, "that a limited application of commercially pure titanium would make possible a saving of approximately five per cent of the structural weight of an airplane. Despite its high cost of \$20 per lb, this use represents the most economical method for saving this critical weight.

"I believe many fail to appreciate how much commercially pure titanium has to offer in airframe structures. While the engine builders primarily are interested in the newer alloys, I do not believe we have to wait for them in structures where gage for gage substitution of stainless steel is possible." Because of its high melting point, Wheelon added, titanium also makes a suitable fire shield up to 2000 F.

Wheelon told the meeting that it is possible and practical to use titanium for the manufacture of aircraft parts. He pointed out that a weight saving of 395 lb was effected in a structure where titanium parts represented approximately 5½ per cent of the structural weight, and suggested that titanium can replace both aluminum and stainless steel. Fabrication difficulties are greater than with the aluminum alloys. Forming of titanium is similar to that of aluminum and machining is similar to that of stainless steel.

New devices and techniques for refueling aircraft can take from five to 25 min off the time formerly required for the job, according to Ralph H. Lebow, staff engineer, Aircraft Fuels Systems, The Parker Appliance Co. Until recently it has required 56 to 100 min to fill a 5000 gallon tank, and since some of the larger bombers carry five times as much fuel, military operations were seriously hampered. By using high speed pressure fueling systems, it is now possible to deliver gasoline into aircraft fuel tanks at rates up to 600 gpm, thus filling a 9000 gallon tank in about 15 min. The mechanical device is a single point ser-

ving system which feeds fuel to all tanks through a manifold, and which facilitates not only fast refueling, but the rapid defueling required for carrier based planes. Installations can be governed by desired fueling and defueling rates, thus saving weight when and where necessary.

Lebow predicted that in-flight refueling would receive increasing attention, not only because it permits uninterrupted flight, but also because a heavily-laden plane can take off with light fuel load and receive fuel in the air.

Developments for greater crash safety in aircraft were described by Robert Schroers, chief, Structures Branch, Aircraft Division, CAA. Statistics reveal that approximately one-fourth of fatalities are caused by post-crash fires.

Experiments seeking to determine how strong a crash-resistant fuel tank should be have led to the conclusion that the development of such a tank is impractical, the construction of a container having a resistance of 30 times the force of gravity is approaching the impossible. Consideration is being given to the production of bladder-cell type tanks, fabricated in part of rubber materials, which have withstood forces about 20 times the force of gravity.

A related problem is fuel line failure, which commonly occurs in nacelles when engines are torn from mounts and fuel tanks are ruptured. It is proposed to develop breakaway, self-sealing couplings for fuel lines at fire walls and other critical locations which would operate by direct pull and would seal the fuel in the lines.

The U. S. Navy is conducting extensive research in the development of aircraft and powerplants, with special consideration for turbo-prop, jet, and rocket engines. The research program includes materials as well as planes and engines, and covers all the numerous types of planes the Navy requires, according to Rear Admiral C. M. Bolster, Chief of Naval Research. The Navy's interest in turbo-prop powerplants stems from the need for high takeoff thrust, good performance at all altitudes, and high fuel economy.

Admiral Bolster predicted that aircraft development will make great strides in the near future through improved performance resulting from the application of transistors and other electronic equipment. The use of reasonably priced titanium and other metals and materials will give lighter airframes and improved aircraft components.

Turbo-prop engines perform safely and reliably, and

their ease of maintenance has surpassed manufacturers' expectations, according to G. R. Edwards, Vickers-Armstrong Ltd., builders of the first civilian turbo-prop to fly. Conversion of crews from piston engines to jets is achieved within hours. Edwards reported many instances of time-saving in operations, saying that the average time from starting the engine to start of takeoff is only 2½ min. In the case of routine engine maintenance, powerplants are changed in 35 min, starting motors in 15 min, and feathering pumps in 30 min, while turbine inspections can be completed in 10 min.

Dr. Igor I. Sikorsky received the 1951 Daniel Guggenheim Medal for his lifetime work in aircraft development. P. R. Bassett, chairman, Daniel Guggenheim Board of Award, made the presentation.

Twenty-four manufacturers made up this year's engineering display: AiResearch Manufacturing Co., Aeroquip Corp., Solar Aircraft Co., Stratos Division, Fairchild Engine & Airplane Corp., Lord Mfg. Co., Lear, Inc., Chiksan Co., Kelite Products, Inc., Barber-Coleman Co., Bobrick Mfg. Corp., Hi-Shear Rivet Tool Co., Hydro-Aire, Inc., Cleveland Pneumatic Tool Co., Aircraft Division, Westinghouse Air Brake Co., Resistoflex Corp., AeroProducts Division, General Motors, Johns-Manville Sales Corp., Pacific Scientific Co., Western Gear Works, Pacific Airmotive Corp., Vickers, Inc., Scintilla Magneto Division, Bendix Aviation Corp., Ryan Aeronautical Co., and New York Airbrake Co.

On the following pages are abstracts of three important papers presented at the meeting:

Recent Sandwich Construction Developments

By W. S. Saville

Chief Plastics Engineer,
Consolidated Vultee Aircraft Corp.

THE development of aluminum alloy honeycomb core within the last three years gave considerable impetus to sandwich construction. This new core material overcame many of the objections such as fungus attack and poor water resistance, of other core materials. Also the idea of using an aluminum honeycomb seemed to be more attractive to the airplane designer. Thus, the decision to change core materials from cotton to aluminum on the Convair Liner and T-29 airplanes seemed to be a logical step.

A weak link in the sandwich chain was the bond between faces and core. Obviously the aluminum alloy faces are no problem. The aluminum alloy honeycomb core is manufactured in production machinery that insures a consistent product. The bond, then, is the one variable that must be controlled and improved.

Convair had for some time been bonding metal to metal, using a tape adhesive. This tape had never been tried on sandwich primarily because of its excessive weight compared to materials normally used for bonding of sandwich. Narmco, Inc., manufacturers of the tape, were contacted and requested to make a tape weighing a maximum of 0.040 psf. This new tape proved to be a great improvement. Whereas it was possible on the previous material to rip the thin faces from the core with little effort, this new bond required considerable force. Convair then set out to evaluate this new bond.

The first problem was to determine a satisfactory method of measuring the force or "peel" stress required to remove a given face from a given core. A fixture was developed utilizing a drum on to which a face is attached,

and rolled off the core. The force in in.-lb required to rotate this drum was then recorded by both visual and graphical methods. On testing the old bond versus the tape bond under a given set of conditions it was determined that the tape bond had approximately four to eight times the peel strength of the liquid bond.

It was decided that the best method

of simulating service conditions on the T-29 and Convair Liner flooring was by means of an impact fatigue test. In this test, a sandwich panel is placed across two parallel beams 18 in. apart and a loaded disk dropped on the center edge of the panel. Under these conditions the best of four panels having the conventional low peel bond failed at a maximum of 21,000 cycles. The best of four high peel specimens failed at 108,000 cycles. In the latter case the failure was a tension fatigue failure in the bottom face. Tests are continuing on this phase of investigation but preliminary results certainly show a vast improvement of the high peel bond over the material used in the past. Also shop damage is reduced to a minimum.

With the advent of aluminum honeycomb and the high peel bond, interest in sandwich construction has increased to a marked degree. As an indication of Convair's use of the material, future Convair Liners will use sandwich construction in the following items: cargo and passenger flooring, partitions, doors, hat racks, luggage racks, wing access doors, and the elevator shroud.

These, plus other miscellaneous items amount to approximately 900 lb of sandwich per airplane.

Fuel Tank Explosion Suppression

By Jack Isreeli

Simmonds Aerocessories, Inc.

REDUCING the damaging effects of explosions in aircraft is a problem receiving a good deal of attention in the United States as well as abroad. The incidence of explosions in aircraft fuel tanks is sufficiently large so that directives have been issued for installation

of airborne equipment to take the sting out of the explosion. This report outlines the development of the explosion suppression system.

Fig. 1 is a plot of the typical pressures experienced during an explosion in a confined space of a fuel air mixture. At 10 milliseconds after the inception of the explosion, the pressure is still a moderate 1½ psi; in 15 milliseconds the pressure rises to five psi; in 42 milliseconds the pressure rises to 90 psi. Maximum explosive pressure is approximately 110 psi. The relatively slow increase of pressure during the first 10 milliseconds suggested the use of a rapid-acting suppression system. Original work was performed with laboratory equipment and proved the feasibility of the method.

Pressure of a suppressed explosion is shown in Fig. 2. Explosion pressure up to 10 milliseconds of time is identical with the free explosion shown in Fig. 1. During this period of time the suppression equipment takes action and the

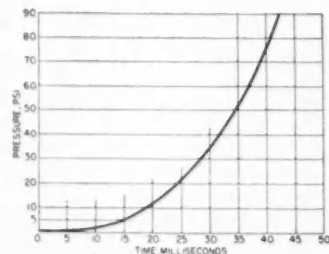


Fig. 1—This is a typical pressure plot during an explosion in a confined space of a fuel-air mixture.

National Aeronautic Meeting—(Continued) . . . Paper Abstracts

pressure increase is broken, never rising to a value of more than three psi. The ripples of pressure are the trace of the action of the suppression equipment. Since aircraft fuel tanks can be relied upon to withstand a pressure of perhaps 10 psi only, the advantages of the suppression system can be appreciated.

Principal elements of the explosion suppression system consist of a detector and a distributor cap which are placed within the tank and are connected to battery supply. Fig. 3 shows a diagram of an installation in a tank. Upon an explosion originating from some source of ignition, pressure waves, traveling at the speed of sound, trigger the detector so that the electrical circuit is closed. The detonator placed in the cup is as a consequence blown, thereby shattering the frangible hemisphere in the cup and scattering a suppressing

seconds. The entire sequence of events takes place with a time lag of four or five milliseconds. For this reason, it is necessary to place distributor cups within the tank so that all the portions of the tank space receive suppressing fluid before the flame front expands sufficiently to increase pressure within the tank above the allowable limit which is usually 3 psi.

As a general rule it is preferable to design an installation so that any one cup be relied upon to suppress within a radius of only 18 in. to 24 in. Within this radius the scatter speed is approximately 300 fps. The actual range of the scatter mist is considerably beyond 24 in., but the time for scatter must be considered. For complete protection against explosions, calculations and tests so far indicate that eight cc of suppressing fluid per gal of space is required. It may be possible to substantially decrease the quantity of suppressing fluid if less than complete, but a still practical, protection can be accepted.

Various fluids can be used. Carbon tetrachloride is a common extinguishant and acts by cooling and chemical inerting. This fluid may also be considered to act to unbalance the fuel air ratio. Water has been used successfully and acts mainly by cooling. Other standard extinguishants can be used. Gasoline has been used as an extinguishant in a few tests and it success-

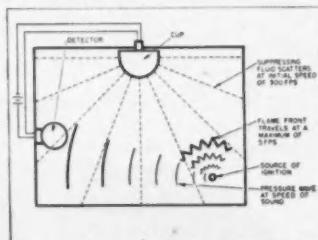


Fig. 3—A tank equipped with an explosion suppression system uses a detector and a cup filled with a suppression fluid. When an explosion occurs, the detector sends a signal to a detonator in the cup. The detonator blows the frangible hemisphere of the cup, thus permitting the suppression fluid to escape.

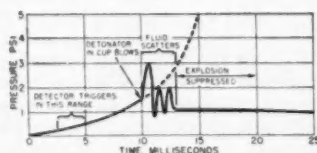


Fig. 2—When an explosion suppression device is used, the pressure build up only reaches three psi.

fully suppresses the explosion by creating a too-rich fuel air ratio. Some information has been presented which would indicate that the flame front in an explosion can, under specific conditions, travel at the speed of sound. Obviously in such explosions the suppression system is not effective. Flame fronts of this speed have not been met in the present experimental work. Some information has been reviewed which indicates that these speeds are met only in explosions in long tubes at initial pressures substantially above atmosphere.

fluid throughout the tank. Scatter patterns of the fluid have been photographed with high speed cameras and the speed of scatter was measured in this way. Initial speeds are in the order of 300 fps. The flame front travels out from the source of ignition at a maximum of five fps. Data reviewed to date indicate that five fps represents a value of flame front speed somewhat beyond the highest met. With the flame front developing as slowly as it does, there is ample time in a properly designed installation for the detector to pick up the pressure increase, trigger the detonator, and for the resultant scattering of the fluid throughout the tank to quench the flame front.

In engineering an installation, careful attention must be paid to the details of timing. Since the pressure increase is transmitted at the speed of sound, the time lag involved in triggering the detector is negligible. A lag of about two milliseconds is involved in detector operation. Time required for the transmission of the electrical signal to the detonator can be ignored. The detonator blows within a time of two milli-

seconds. The entire sequence of events takes place with a time lag of four or five milliseconds. For this reason, it is necessary to place distributor cups within the tank so that all the portions of the tank space receive suppressing fluid before the flame front expands sufficiently to increase pressure within the tank above the allowable limit which is usually 3 psi.

As a general rule it is preferable to design an installation so that any one cup be relied upon to suppress within a radius of only 18 in. to 24 in. Within this radius the scatter speed is approximately 300 fps. The actual range of the scatter mist is considerably beyond 24 in., but the time for scatter must be considered. For complete protection against explosions, calculations and tests so far indicate that eight cc of suppressing fluid per gal of space is required. It may be possible to substantially decrease the quantity of suppressing fluid if less than complete, but a still practical, protection can be accepted.

Various fluids can be used. Carbon tetrachloride is a common extinguishant and acts by cooling and chemical inerting. This fluid may also be considered to act to unbalance the fuel air ratio. Water has been used successfully and acts mainly by cooling. Other standard extinguishants can be used. Gasoline has been used as an extinguishant in a few tests and it success-

Trends in Air Force Research and Development

By Major General D. L. Putt, USAF

Acting Deputy Chief of Staff, Development

Fighter Developments

SUPERSONIC flights of the Bell X-1 aircraft removed the word "barrier" from the term "sonic barrier." By using the research data obtained from the X-1, and other more recent research aircraft, many of the stability and control problems associated with supersonic flight have been solved. Development has now evolved into an orderly technological process of engine development and airplane design to attain supersonic production fighter aircraft.

If average fighter aircraft speeds and operating altitudes over the last 25 years were plotted—and these curves extended to 1955—it would show that fighter aircraft will be operating at speeds of over 1000 mph and at altitudes in excess of 50,000 ft. There is

no reason to doubt that our aviation industry can produce these aircraft. In order to achieve better supersonic aerodynamic characteristics, we must use thinner wings. At the same time, the greater strength required has necessitated the use of a thicker skin with less internal structure. This required the development of a machine process capable of tapering and forming skin sections, the maximum thickness of which will approach $\frac{1}{4}$ in.

Substantial progress in the performance of aircraft has been made, but we cannot improve the human characteristics of the pilot. The practical limit of visual recognition of a target is still between five and 15 miles. Five years ago, this gave a pilot about one min of collision-course time to plan (Turn to page 108, please)

Machining Problems With Titanium Alloys



Aircraft engines represent but one of many potential uses for titanium alloys. This experimental piston of Ti-150A has been forged, heat treated, machined and stress relieved. Typical properties of this alloy at room temperature are: 150,000 psi, uts; 130,000 psi, yp (at 0.2 per cent); 15 per cent elongation; 300 Bhn.

TITANIUM's properties are of tremendous importance to the aircraft industry (high strength, light weight, high endurance limit, corrosion and heat resistance), and most of its experimental applications are in this field. Among the metals extensively used in the aircraft industry, the austenitic stainless steels come the closest to titanium in giving an approximate concept of how the new material can be expected to machine.

Reports from several of the aircraft builders give this impression. Tests show that titanium is considerably more difficult to machine than stainless steel, and that it would better be classified in the range with the less familiar high-temperature, jet-engine alloys. In fact, comparing titanium with stainless steel is justifiable only in that both alloys are highly work-hardenable and cut with a tough, stringy chip. To this extent, the comparison serves as a starting point for new users of titanium alloys.

Turning

High-speed steel tools, having the following angles—zero deg back rake, 15 deg side rake, zero deg side cutting edge angle, five deg end cutting edge angle, five deg relief, afford nine cu in. tool life at 40 fpm cutting speed at 0.009 ipr feed and 0.062 in. depth of cut. A water-

soluble cutting fluid was used. Carbide tools provide 10 cu in. tool life at 200 fpm cutting speed. Early laboratory tests indicate that feed should be about 0.012 ipr. Cast-iron grades of carbide appear to give the best results.

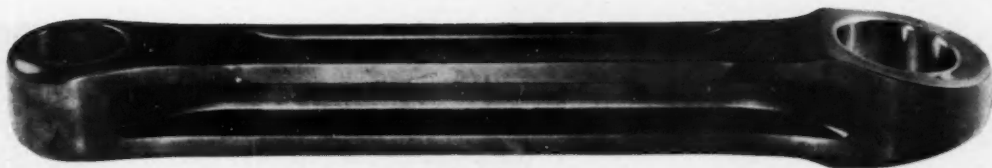
One of the important processing operations on titanium is the lathe cleanup of billets prior to all forging and rolling operations. The surface condition of these billets is poor because of casting pits, slag inclusions, hard particles, and contaminated alloy. These surface defects must be removed before billets are processed to avoid distributing the contamination throughout the finished product and to prevent damage to forging and rolling tools.

Some improvement to the surface can be effected by sand or shot blasting, and by etching as much as 0.008 to 0.012 in. if necessary. Some of the worst defects are removed by scarfing or snagging.

Simple turning is the most straightforward metalcutting operation and the easiest to analyze. For many reasons, it offers the simplest method for comparing machining properties of different materials. Quantitative machinability test work on titanium alloys of the magnitude and scope of steel tests is just beginning.

Milling

Other machining operations, although basically similar to turning, are vastly more complicated. Com-



The connecting rod was forged from Ti-170A, a slightly stronger alloy than Ti-150A. Titanium is also being tested for jet engine applications, many kinds of airframe components, and is likely to find other uses.

parative test findings on milling, drilling and all the others immediately introduce an array of additional variables. Factors such as cutter diameter, number of teeth or flutes and helix angle, to mention a few, make the analysis more difficult. Comparative information may be misleading, therefore, unless tests are conducted under identical conditions.

The presently available data on milling and drilling are all of a preliminary trial nature to uncover the best course to follow in more detailed test work. A few isolated findings are given. In general, it can be said that titanium alloys can be machined fairly satisfactorily at speeds in the vicinity of 70 fpm.

One company's experiments in milling as of Janu-

ary, 1951, are interesting. They have found 18-4-2 high-speed steels about the best of the steel tool materials and cast-alloy cobalt-chromium tools superior to carbides. One trouble in carbide milling is that carbide sections tend to flake off due to combined effects of intermittent cutting and the "welding" of chips to tool-face. Axial-flow compressor blades are being made from Ti-150A as a possible substitute for AISI 410 stainless steel. Data on this operation follow.

With Tantung side and end mills operating at about 90 fpm (four-in. diam, 75 rpm), tool life is about 150 pieces per cutter grind. With Vasco Supreme (18-4-1) high-speed steel end mills, the ends of 1¼ by 1½-in.

(Turn to page 102, please)

Comparison Table: Titanium Alloys and Other Engineering Materials

APPROXIMATE COMPOSITIONS, PERCENT

APPROXIMATE PROPERTIES

	IRON	CARBON	CHROMIUM	NICKEL	MOLYBDENUM	COBALT	ALUMINUM	MANGANESE	TITANIUM	COLUMBIUM	COPPER	MAGNESIUM	TUNGSTEN	Milling Range, F. plus and minus 30°	Density, lb./cu. in.	Thermal Conductivity, Btu (ft./hr.)/°F./in.	Thermal Expansion, in./in./°F. x 10 ⁶	Magnetic?	Test Condition for Mechanical Properties	Ultimate Tensile Strength, psi x 1000	Yield Strength, psi x 1000	% Elongation, 2"	% Area Reduction	Modulus of Elasticity, psi x 10 ⁶	Brinell Hardness	Temperature Rating °F. 20,000 psi for 100 hr. 100,000 psi for 10 hr. (Metal Progress, Oct. 1950)
LIGHT METALS	TITANIUM 150A	1.2	2.7	—	—	—	—	—	Bal.	—	—	—	—	2960	.17	105	5.05	No	annealed	150	130	15	40	15	300	—
	TITANIUM RC-130-B	—	—	—	—	—	4	4	Bal.	—	—	—	—	2990	.17	—	—	No	annealed	145	135	15	40	15	300	—
	TITANIUM L-2740	—	5	—	—	—	3	—	Bal.	—	—	—	—	2930	.16	—	5.0	No	annealed	165	150	10	35	15	350	—
	ALUMINUM 245-T4	—	—	—	—	—	Bal.	.6	—	.8	4.5	1.5	—	1050	.10	845	13.3	No	sol. treated and aged	68	45	20	50	10	120	—
STEELS	AISI 347	Bal.	.08	18	10	—	—	—	—	.8	—	—	—	2525	.29	335	6.6	No	annealed	85	40	55	65	29	250	—
	AISI 410	Bal.	.15	12	—	—	—	—	—	—	—	—	—	2725	.28	160	5.7	Yes	quenched and tempered	150	130	20	65	25	300	—
	AISI 430	Bal.	.12	16	—	—	—	—	—	—	—	—	—	2675	.28	156	5.4	Yes	annealed	70	40	35	70	29	150	—
	AISI E4340	Bal.	.40	1	1.8	.3	—	.75	—	—	—	—	—	2680	.28	350	7.65	Yes	quenched and tempered	180	130	20	55	30	300	—
HIGH-TEMPERATURE ALLOYS	S-616	Bal.	.4	20	20	—	43	—	—	4	—	—	4	2480	.31	101	6.6	No	sol. treated and aged	140	67	35	30	35	300	1000
	Inconel "X"	8	—	15	73	—	.7	—	2.5	1	—	—	—	2570	.30	85	7.6	No	sol. treated and aged	160	90	25	30	31	300	1400
	Refractaloy 28	Bal.	.03	18	37	3	20	.2	.7	2.6	—	—	—	2570	.30	—	—	No	sol. treated and aged	180	110	25	45	30	300	1500
	Discaloy 24	Bal.	.03	13	26	3	—	.1	.8	1.6	—	—	—	2570	.29	—	—	No	sol. treated and aged	145	105	20	25	28	300	1300
	Timken 16-25-6	Bal.	—	16	25	6	—	—	—	—	—	—	—	2500	.29	—	8.4	No	work hardened	135	100	15	20	28	300	1250

Tests Prove Value of Ceramic Coatings

By **Wilson G. Hubbell**

Chief Metallurgist
Ryan Aeronautical Co.

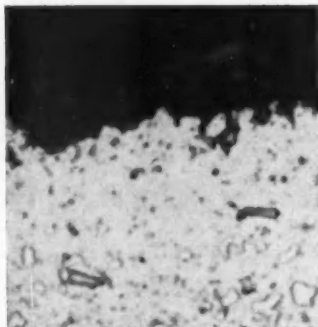


Fig. 1—Photomicrograph (Glycergia 500X) showing the interior of 19-9DL ceramic coated header at 650 hours test. Note the white decarburized zone immediately under the ceramic coating and the formation of sigma and carbide.

Fig. 2—This photomicrograph (800X) shows the surface of 19-9DL header polished to determine the hardness of light etching zone at surface. Hardness test impress represents actual depth of about 0.0005 in. below the surface.

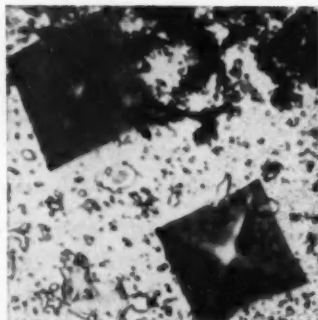


Fig. 3—Typical "salt and pepper" structure of carbide and sigma, and some oxide solution at surface of material with moderate build-up on the surface of 19-9DL uncoated header after 1269 test hours (Glycergia 500X).

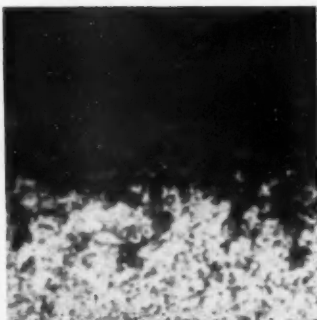
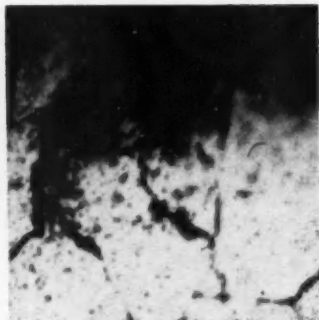


Fig. 4—Advanced condition of intergranular corrosion after 472 hour test is shown in this photomicrograph, Glycergia 500X, taken at the hottest operating area of wear band.



IN a metallurgical report just completed by the Ryan Aeronautical Company's Development Laboratories, the life-extending properties of very thin ceramic coatings on exhaust systems are verified with technical data.

Latest development in Ryan's progress with ceramics, this study discloses the intimate metallurgical changes which occur in ceramic coated exhaust manifolds at elevated temperatures. By the means of photomicrographs, spectrograms and microhardness readings, the laboratory has validated the significant advantages which ceramic coatings provide and which have been indicated by flight test observations.

No deterioration by oxidation, carbon absorption or corrosion attack was evidenced in the ceramic-protected exhaust headers which were tested in actual flight for periods running to 1623 hours. This is the first occasion in Ryan experience where an examination of high temperature headers disclosed no deterioration after substantial hours of service.

This extended life is important both from a standpoint of better service and as a substantial aid in the conservation of critical elements which are in short supply and which are generously used with





Wilson G. Hubbell, Ryan chief metallurgist, arranging test setup for heating ceramic coated test headers to 1700 F prior to thermal shock test.

ceramic will stand a surprising amount of mechanical impact without sustaining damage.

Several months ago Ryan arranged with Pan American World Airways and the Boeing Airplane Co. for the flight testing of the exhaust system headers on the R-4360 Pratt and Whitney engines of Stratocruiser aircraft operating on the transpacific run. Subsequently, a variety of exhaust headers, both coated and uncoated with ceramic material have been tested and examined to form the basis for the metallurgical report.

No reduction in thickness was found by dial gauge measurement in the headers which were ceramic coated on both interior and exterior surfaces. On the headers which were coated on the interior only, a reduction of 0.003 in. was found to have occurred on the exterior surface as a result of high temperature scaling.

A photomicrograph, Fig. 1, taken at the hottest zone (interior) of the header coated on both sides, shows a definite white area lying immediately under the surface of the ceramic material, which has been decarburized. This loss of carbon, which is an associated phenomenon with the use of the ceramic material at elevated temperatures, is an advantageous development because it reduces the chance of surface embrittlement or loss of ductility.

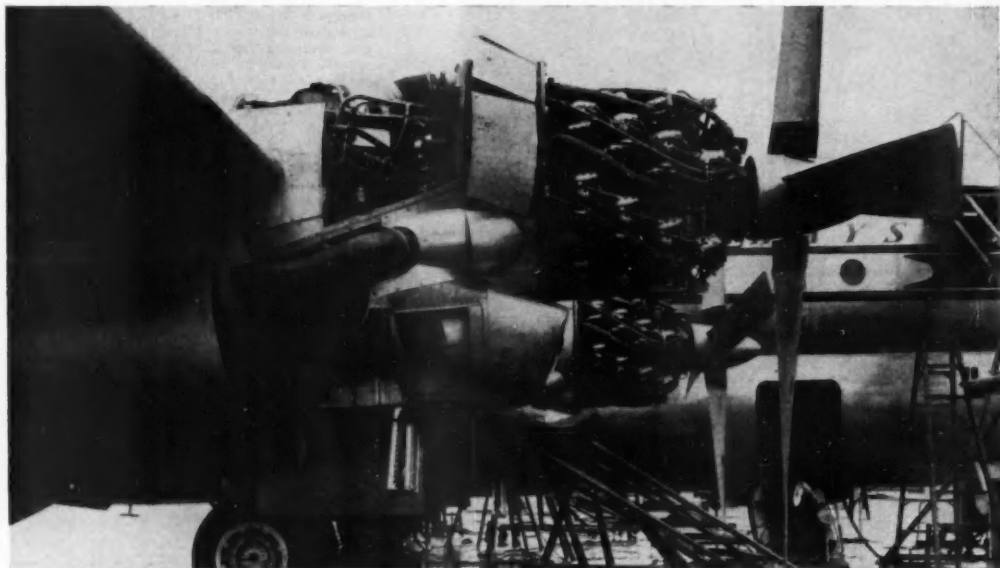
It was necessary to determine that the white zone was caused by decarburization rather than by absorp-

corrosion-resistant alloys. It means that the so-called "luxury" class of alloys for jet and piston engine applications can in many cases be supplanted by cheaper alloys when given the benefit of life-extending ceramic coatings.

The report also includes the encouraging results of a thermal shock test conducted with the ceramic coated headers. This study shows that the 0.001 to 0.002 in. thick coatings are not affected by thermal shock as encountered in exhaust system service at any temperatures between -70 F and 1700 F and that the



Attaching flanges to ceramic coated exhaust systems for aircraft engines.



Power plant installation in Boeing Stratocruiser in service of Pan American World Airways showing the location of Ryan-built exhaust system components.

tion of some constituent of the ceramic coating because in the case of the latter circumstance, the metal would have become harder and undesirably more brittle. This had to be watched because the ceramic material contains silicons which could conceivably work as efficiently to harden the stainless steel manifolds as they do when used for hardening tool steels—if they were absorbed in appreciable quantities.

Microhardness tests were made of this white area, indicating that the zone was not hardened and that it was decarburized. Photomicrograph Fig. 2 shows the surface of this header, which was polished to determine the hardness of light etching zone at the surface. The hardness impress represents an actual depth of about 0.0005 in. below the surface and gave hardness readings of 20.5 Rockwell C. at the surface with an average interior hardness of 25.0 Rockwell C.

Also shown in Fig. 1 is the evidence of small quantities of carbide. This amount and distribution is normal with this material as it comes from the steel mill and has not been caused by service conditions. From this photomicrograph it can be seen that the ceramic coatings have protected the surface. The interior of this header was very smooth. The natural green color of the ceramic coating had changed to black in appearance. A sample of this black coating, when subjected to spectrographic analysis, indicated that it contained the same ingredients as the original green coating—showing that the ceramic material had not been removed but merely altered in appearance.

The Fig. 3 photomicrograph was taken of a header which was not coated with ceramic material but which was made from the same metal as that used with the

coated headers. In this control header, a typical "salt and pepper" structure of carbide formation can be observed. This amount and distribution is substantially greater than normally found in the new metal. It indicates that the elevated temperatures have caused carbon to be absorbed from the exhaust gases and precipitated within the grain structure of the metal.

This photomicrograph shows the formation of some oxide solution at the surface of the metal and a moderate build up on the surface. These oxides have penetrated into the metal, entering at the grain boundaries.

In photomicrograph Fig. 4 we see an advanced condition of intergranular corrosion or a separation of the grains of metal by corrosion. This header was fabricated from another metal which does not have the ability to withstand the high temperatures at which this part must operate. There is a heavy carbide precipitation and carbon absorption in evidence, which preceded and prepared the way for the intergranular corrosion. Oxide solution has also taken place.

Oxidation and carbide precipitation lead to rapid deterioration during service life under the conditions peculiar to this application. It is seldom that intergranular corrosion is observed in materials designed for conducting gases at high temperatures. Most materials, even though they contain high percentages of unstabilized carbon, develop a tightly adherent film which excludes the product causing corrosion. In this case, however, the material developed a loose scale which did not prevent continued attack by corrosive media.

(Turn to page 114, please)

Deburring Precision Parts by Wet Tumbling Method

By Herbert Chase

EFFICIENT deburring by mechanical rather than by hand methods is becoming of increasing importance to automotive as well as to other manufacturers of metal parts. This is true especially when, as for new automatic transmissions, extreme precision and close fits are essential. Any burrs that may come free of the parts in service to jam between fitted surfaces or lodge in small openings may do serious damage or even render the transmission inoperative.

These facts are well recognized by production executives of the Warner Gear Division, Borg-Warner Corp., as is witnessed by the application of Roto-Finish equipment for burr removal in their Muncie, Ind., plants and especially in those departments where the new automatic transmission for cars produced by the Ford Motor Co. is manufactured.

Burr removal is done not alone on steel parts, including some stamped and some made from bar stock, but also on non-ferrous parts some of which are die cast from aluminum alloy. In most cases, these parts are completely machined, including grinding, and it is essential that burrs be taken off without breaking or marring sharp edges and that machined surfaces remain unaffected save for the slight scouring action that tends to reduce notice-

Fig. 1—Ten different valves for automatic transmissions, two stampings and a part produced from rectangular bar stock. All of these parts are steel and all are deburred by tumbling, as described in text.

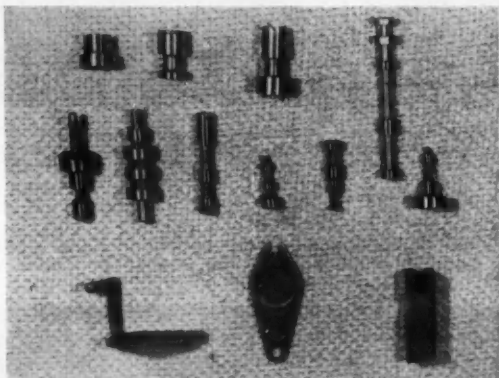
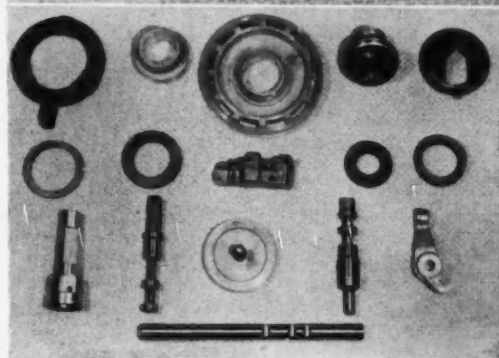


Fig. 2—These parts, including several of steel, four aluminum die castings (top center) and some in bronze; are deburred by tumbling in rubber lined barrels using chiefly grinding chips and Roto-Finish compounds.



able marks left by the cutting tools.

These results are attained on types of precision parts on many of which, up to a few years ago, tumbling would have been considered unthinkable. But modern wet tumbling, done in synthetic rubber lined barrels that turn at slow, controllable speed, completely avoids the damaging impacts once associated with tumbling. The simple requirements are to use the proper media and control, and to run the barrels at proper speed and for a time per load that will yield the desired results. In general, the best conditions are determined by experiment and then



Fig. 4—After parts, deburred by tumbling, are placed in wire baskets when taken from barrels, the baskets are passed through this washer on a roller conveyor to remove all foreign matter before assembly.

Fig. 7—Using a pan, designed for chip handling, to charge a load of chips into a barrel. An electric hoist supported from a trolley on a crane beam avoids all manual lifting.



are applied to each batch according to the definite schedule set.

Typical of one class of parts Roto-Finished with much success are the valves shown in Figs. 1 and 2. These are turned from steel and then are centerless ground to exceedingly close dimensional limits. All these parts have two or more step diameters at the edges of which fine burrs are formed. These burrs must be removed but the edges must remain sharp and square and even careful hand burring would not do this job uniformly. Yet it is done by tumbling.

Rubber lined barrels like those shown in Fig. 3,

each having two compartments, are set to turn at six rpm. In each compartment are 700 lb of No. 5 grinding chips, one lb of No. 11 Roto-Finish compound and 30 gal of water. Into this mass from 240 to 1000 valves are loaded by hand, a few at a time; the lower number for the largest and the higher for the smallest parts. Care is used not to mar edges or diameters in handling and submerging the parts in the medium.

When the charge is in place, compartment doors are fastened and the barrels are run only 10 min at six rpm. Covers are then removed and the parts are taken out by hand, after the compound has been flushed out, again using care not to cause marring by impacts. The latter might be expected in the tumbling itself but, with the very slow speed and the parts submerged, only a gentle sloshing action occurs. This action in the grinding chips does remove the burrs. If it continued long enough, it would round edges, but, with the short run, they remain square, as specified.

When taken from barrels, parts are placed in wire baskets and put through the Alvey-Ferguson washer, Fig. 4, which uses clear water heated to 180 F to remove any fine particles not left in the barrel. Parts then are dipped in a rust inhibitor and are drained before transfer to storage or assembly departments.

For stampings, such as that at lower left in Fig. 1, which is not precision machined and has heavier burrs than the valves, 200 lb of parts and 700 lb of No. 3A or 3B size grinding chips are employed with one lb of No. 11 compound and enough water to cover the load. This charge is run for 20 min at 20 or 25 rpm, as this effects sufficient burr removal. It is not essential in such parts that all of heavy burrs be removed (say at inside corners where the stamping is bent), as long as there is no chance of the burr coming loose in service. Such parts can be charged and dumped in bulk and separated on a screen in a shaker, as such impacts as then occur effect no significant damage.

Larger stampings, such as cover plates for overdrives, are run for 15 min at 15 rpm in No. DW-60-36 two-compartment Roto-Finish barrels charged with 800 lb of No. 4A grinding chips and one lb of No. 255 compound, plus water. This removes burrs from grinding and broaching. Front servo cover stampings (top right corner in Fig. 2) are done in the



Fig. 6—Unloading aluminum die castings after deburring. A small basket at the barrel opening keeps parts from falling, thus avoiding impacts that might mar sharp edges or finished surfaces.

same media as the others, but are run $\frac{1}{2}$ hr because of the fact that burrs are heavier.

For the steel block pawl for overdrives (lower right corner, Fig. 1) a load of 1000 lb of parts plus 700 lb of No. 3A chips, one lb of No. 255 compound and water to cover, is run in a 36-in. barrel one hr at 20 rpm to remove broaching burrs in the slotted end, which is hardened. Shifter fork rails, bottom of Fig. 2, receive the same treatment to remove burrs at milled detent slots. The same applies to overdrive shifting collars (right end of second row from top, Fig. 2) which have helical internal teeth.

Steel control levers turned to a taper from bar stock and made in lengths of 21 to 31 in. have burrs at a milled slot. They are tumbled in long and slender Roto-Finish barrels, one of which appears in Fig. 5. These barrels were made in small diameter especially for this purpose, so that the levers cannot turn crosswise of the barrel and be bent. Each compartment is loaded with 150 levers along with 400 lb of No. 4B synthetic chips and one lb of No. 255 compound. These chips are of such shape as not to lodge in slots. A $\frac{1}{2}$ -hr run at 15 rpm removes burrs effectively.

For all aluminum parts, of which there are eight or nine different shapes and sizes, all die cast, barrels like those in Figs. 3, 6 and 7 are employed and are run at six rpm. A typical load is 240 pieces, put in by hand, 700 lb of No. 3A or 3B chips and one lb No. 255 Roto-Finish compound. Deburring of these precision machined
(Turn to page 83, please)



Fig. 3—One row of four Roto-Finish barrels in which both steel and aluminum parts are deburred. Operators in background are doing hand loading and unloading of aluminum parts that require care in avoiding impacts.

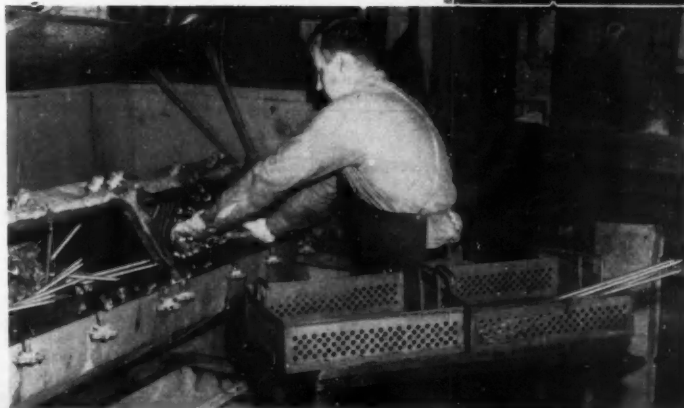


Fig. 5—One of two special barrels employed for deburring shifter lever bars. Long compartments of small diameter are used to prevent the bars from turning crosswise and becoming bent.

METALS

Industries Confused by Increase in Lead and Zinc Prices. Aluminum Production Progressing on Schedule

By William F. Boericke

Price Increases

The increase in lead and zinc prices announced on October 2 by OPS caught the industry by surprise. It was generally believed that any price advance in the major metals would have been spearheaded by copper. While both lead and zinc were in short supply neither metal was as scarce as copper. Lead in particular had the distinction of not being placed under allotment by the International Materials Conference which indicated less alarm over the supply than for copper and zinc.

However the situation was admittedly unsatisfactory. Mexican producers were asking and receiving 21½ cents a pound for lead f.a.s. Gulf ports. Canadian producers had withdrawn from U. S. markets temporarily. There was no chance whatever that domestic output from the mines would increase. It was actually slipping because of severe labor shortage in the Utah and Idaho mines. Deliveries of scrap lead normally constituting about one-third of U. S. supplies were drying up. Meanwhile the lead battery manufacturers had asked the Government to increase domestic supplies by tapping the stockpile and claimed their industry faced a crisis.

Zinc from the Stockpile

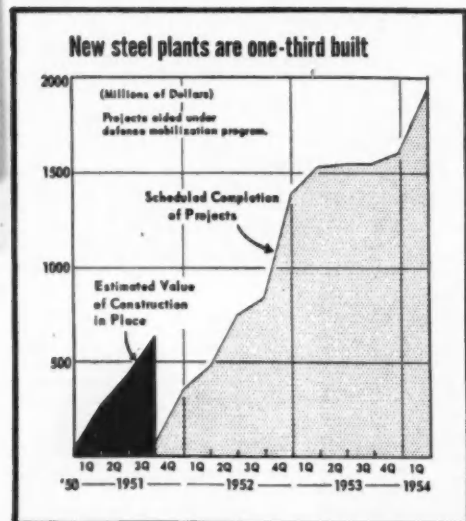
While less vociferous the zinc industry also was

in an unhappy state although a modicum of relief had been obtained through release of some zinc from the stockpile. It also appears that the desperate scarcity of copper had slowed up demands from the brass mills for zinc as they did not need the metal in volume until they were assured of improved copper supply.

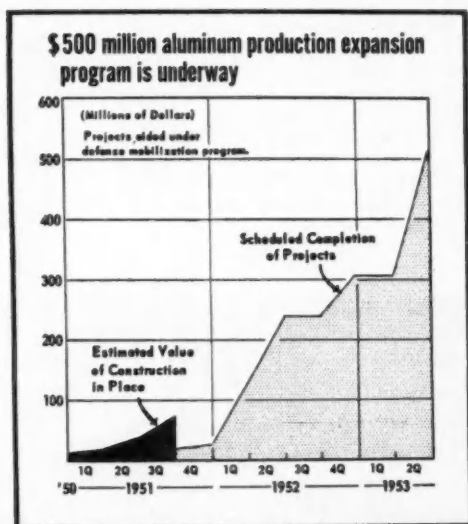
Defense Mobilizer Wilson in announcing the price increase said that the new order was to assure essential supplies of lead and zinc at reasonable prices. In setting the same ceiling prices of 19 cents for lead and 19½ cents for zinc for both domestic metal and metal obtained from abroad he admitted there was some calculated risk of cutting down imports because the new ceilings were still considerably less than the prices that prevailed in Europe for the metals. They may prove to be another instance of too little and too late.

Markets Confused

The immediate result of the price increases was to throw both the lead and zinc industries into confusion. For reasons not divulged, OPS failed at this



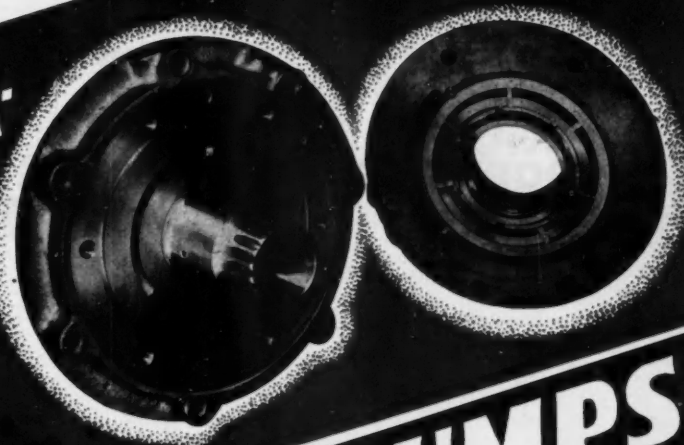
The two charts shown are from Third Quarterly Report to the President by the Director of Defense Mobilization.



time to grant compensatory price ceiling increases to manufacturers of lead products, and even neglected to raise the price of lead scrap in ratio with the increase for refined metal. Scrap dealers informed NPA they would ship no more scrap until their price

(Turn to page 78, please)

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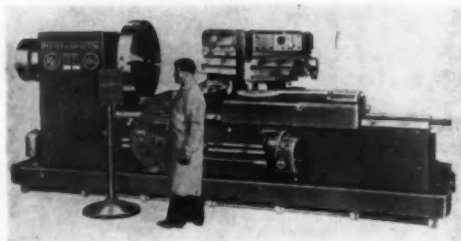
NEW EQUIPMENT



FOR ADDITIONAL INFORMATION regarding any of these items, please use coupon on PAGE 58

E-70—Automatic Turret Lathe

The Potter & Johnston Co., Pawtucket, R. I., has announced its Model 10-U—the latest addition to the P&J line of automatic turret laths. Designed to handle big jobs, it is equipped with a 75 hp multi-vee-belt drive, magnetic clutch and brake. There is a 49 in. diam swing over base ways, a 36 in. diam swing over cross slides for chucking and a 27 in. diam swing over cross slides for machining.



Potter & Johnston automatic turret lathe, model 10-U.

Individual front and rear cross slides, operating from separate timing boxes, can be controlled independently or simultaneously with the movement of

the turret slide. Having a 25½-in. adjustment along the bonded tool steel base ways, the front and rear cross slides and selected tools may be positioned to work from the rear and on the face of the work piece at the same time that the turret tools are machining. The travel of the cross slides is fixed at 8½ in. The manufacturer states that such flexibility of tooling speeds up precision production and materially reduces costs.

Distances from spindle to turret are listed as a minimum of 30 in. and a

and three automatic changes of feed for each set of pick-off gears which work in combination with unique tooling of cross slides and turret.

The model 10-U includes full electro-pneumatic control, hardened and ground speed gearing, air operated chuck and a centralized control station for operating air chuck and all machine functions.

E-71—Multiple Spindle Drilling Machine

Sibley Machine & Foundry Corp., South Bend, Ind., has recently introduced an entirely new design of multiple spindle drilling machine. With three spindles mounted integral to a sturdily constructed column, this Model ME-25 is suited to high volume production.

Unique among features for a machine of medium weight are its 25-in. swing, a variable speed drive from which the exact spindle speed may be obtained for any size drill from ¼ in. to one in., and an extra large table with coolant trough.

ME-25 is powered by a 1½ hp axial air gap motor. Capacity of the machine is ¾ in. in steel and one in. in cast iron. Distance between spindles is 14½ in. Table has a vertical adjustment of 12¼ in. Working surface of
(Turn to page 60, please)

News of the Machinery Industries

New Replacement Plan

The problem of obsolete machinery being used by the metalworking industries for mass production has always been of concern to the machinery manufacturers. Already several studies have pointed out the value of modern equipment as a means toward economical production, but there are still many firms which must be convinced on replacement programs. Just recently, J. E. Loudon of Cone Automatic has written about a new approach which may add more companies to the list of those seeking greater production economies through the purchase of up-to-

date machinery. We believe that it is of interest to note here a few paragraphs from Mr. Loudon's booklet, "There's Room for More on the Balance Sheet."

"It is simple deduction to conclude that this situation in the metalworking industry represents excessive costs which must be absorbed eventually by the stockholder, by the ultimate consumer, or by both. The quality of the 'end' cannot for long be maintained at the sacrifice of the 'means,' which applies to all gain, whether it be food from the soil or earnings from production equipment. The present situation invites new companies, with modern

equipment of more than a 33½ per cent lower cost operating advantage, to enter lucrative fields.

"The purpose of the balance sheet is to give information. And it is reasonable to assume that interested readers would approve any additional information, which, as a part of the sheet itself, or as a separate instrument, would make the balance sheet more useful.

"The productive efficiency of equipment in use in a manufacturing plant, compared to the efficiency of equipment which could be procured to replace it, would be useful information. Whether the efficiency rating appeared in the
(Turn to page 70, please)

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Publications

AVAILABLE

New Industrial Literature listed in this department is obtainable by subscribers through the Editorial Department of AUTOMOTIVE INDUSTRIES. In making requests please be sure to give the NUMBER of the item concerning the publication desired, your name and address, company connection and title.

D-133 Gear Hobber

Michigan Tool Co.—Bulletin No. 1458A describing a new universal single spindle high speed gear hobber is available.

D-134 Products

Clark Equipment Co.—“How the Products of Clark Serve Industry” is the title of a 32-page booklet which illustrates and briefly describes the company's products.

D-135 Motors

Howell Electric Motors Co.—A new technical bulletin on type F punch press motors has just been published.

D-136 Clutches

Twin Disc Clutch Co.—A 32-page “Cross Country” issue of Production Road describes almost 60 applications

of friction clutches and hydraulic drives in as many types of machinery and equipment.

D-137 Optical Comparator

Jones & Lamson Machine Co.—Publication of a new “Optical Comparator” Catalog No. 402 has been announced.

D-138 Buffing Compositions

Hanson-Van Winkle-Munning Co.—Buffing and polishing compositions for the plating and polishing industry are listed and described in Bulletin C-100.

D-139 Chucks

Skinner Chuck Co.—Just published is a 68-page booklet entitled, “Chucks and Their Uses.”

D-140 Plastic Molds

Carpenter Steel Co.—Application and

heat treatment of steels for plastic molding are given in a 40-page book, “Tooling Up for Plastics.”

D-141 Materials Handling Equipment

Rolock Inc.—Offered is a catalog, No. B-8, which contains descriptions and photographs of 75 custom-built fabricated alloy heat treating baskets, crates, racks, retorts, trays, muffles, fixtures, etc.

D-142 Defense Techniques

E. F. Houghton & Co.—A factual 52-page booklet based on defense production experience gained from World War II and supplemented with latest manufacturing and processing techniques is being released.

D-143 Welding Accessories

Hobart Brothers Co.—A 16-page are welding accessories catalog is announced.

D-144 Pyrometer Supplies

Minneapolis-Honeywell Regulator Co.—A new catalog, 100-4, furnishes much useful technical data on the application and use of thermocouple pyrometric supplies. Catalog includes a complete line together with basic prices of all Brown standard thermocouple assemblies including base metal elements and Noble metal elements of all gages.

(Turn to page 100, please)

**TIME
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COUPON**

THIS TIME SAVER COUPON is for your convenience in obtaining, WITHOUT OBLIGATION, more information on any one or more of the publications described above OR New Production and Plant Equipment OR New Products items described on other pages.

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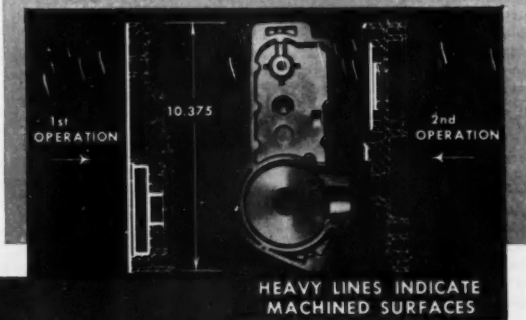
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This P&J engineered Facing Tool on the cross slide machines the front surface of these castings. It is self-relieving, thereby eliminating objectionable tool return marks on the face of the work.



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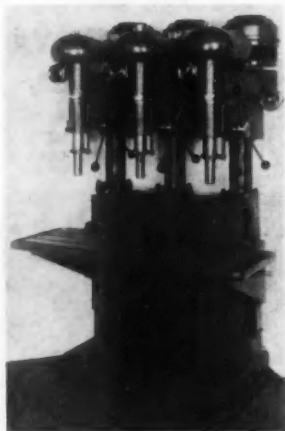
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Numerous similar examples of productivity with P&J Tooling on P&J AUTOMATICS are shown in this free booklet. Write for your copy.

For additional information regarding any of these items, please use coupon on page 58

(Continued from page 56)



Sibley multiple spindle drilling machine, model ME-25.

table is 45 in. by 14½ in. Net weight with motors is 2165 lb.

The wide range of spindle speeds available are obtained by a self-locking speed control. A tachometer on front of machine provides accurate reading of speeds. Five options of spindle speeds each with a four to one ratio are available, ranging from a low of 206-825 rpm to a high of 540-2160 rpm, with a three phase 60 cycle motor. A speed chart on side of machine shows proper speeds for different drill sizes.

E-72—Contour Sawing Machine

The DoALL Co., Des Plaines, Ill., has placed on the market a general purpose contour sawing machine, designated V-36-3. This machine takes continuous saw, file or abrasive bands up to ¼ in. in width. It features a three-speed transmission and speedmaster drive providing variable tool velocity ranging from 25 fpm to 6000 fpm. With this speed range it performs all types of conventional metal sawing or filing, high speed cutting of non-ferrous metal and composition materials and light gauge alloy friction cutting.

This machining adaptability is incorporated in a relatively light unit-welded steel frame 81 in. high requiring only 40 in. by 76 in. floor space.

Model V-36-3 is particularly useful in aircraft production, sheet metal and pattern shops where its 36 in. throat

capacity is advantageous. This model normally carries the saw band over three wheels but when the band becomes too short after several welds, the band may still be used to its full life over two wheels on work requiring no more than a 16 in. throat.

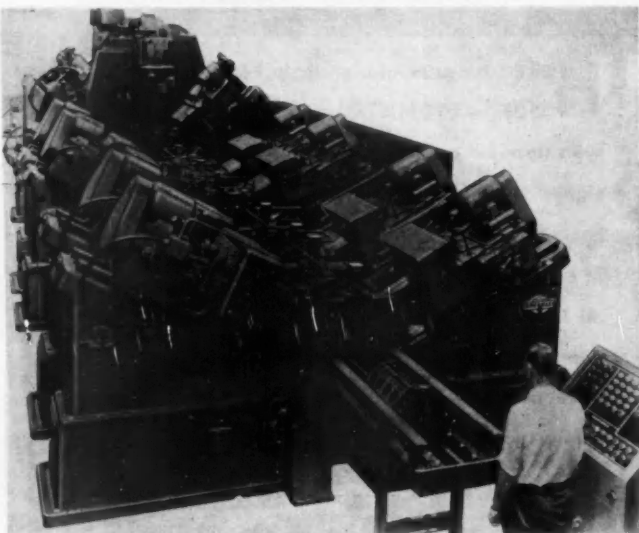
The machine is completely equipped for general purpose contour band machining. It includes: built-in blade welders with squaring shear, motorized grinder and thickness gauge, assorted band tools and guides, automatic power feed, job selector dials, speed indicator, dust spout, adjustable light, chip blower, etc., and like other standard DoALL machines, its variable tool speed and variable feed pressure are controlled and correlated by hand-



DoALL contour sawing machine, model V-36-3

wheels convenient to the operator. Cutting tools are guarded to the point of work. The machine uses a three hp drive motor and magnetic starter with push button control. A large assortment of accessories and two types of hydraulic feed are available for the model to adapt it to special applications.

E-73—Automatic Transfer Machine



This 16-station automatic transfer machine is one of three recently built by Greenlee Bros. & Co., Rockford, Ill. The three units form an automatic production line for machining eight-cyl automotive cylinder blocks, completing 379 individual machining operations on the top, bottom, sides, and end surfaces of the work.

The transfer machine illustrated finishes 81 cylinder blocks per hour at 80 per cent efficiency, performing 123 operations in 35.5 sec. As the last machine in the line, it completes semi-finish-reaming, finish-reaming, and tapping operations.

Cylinder blocks are loaded into the unit with the pan-rail down, front end leading, and are machined in this position through nine stations, where rough and finish-reaming is done on the tappet holes. As the work enters the tenth station, an automatic turnover fixture rotates the piece 180 deg until the pan-rail portion is on top. The following heads then tap 38 holes on the left side and top of each block. After the tapping operations, the work is again turned—90 deg horizontally this time—to present the ends to the remaining stations, which complete 22 additional tapping operations on holes drilled by one of the preceding units.

New Tool Microhones

INTERRUPTED BORES

to precise tolerances

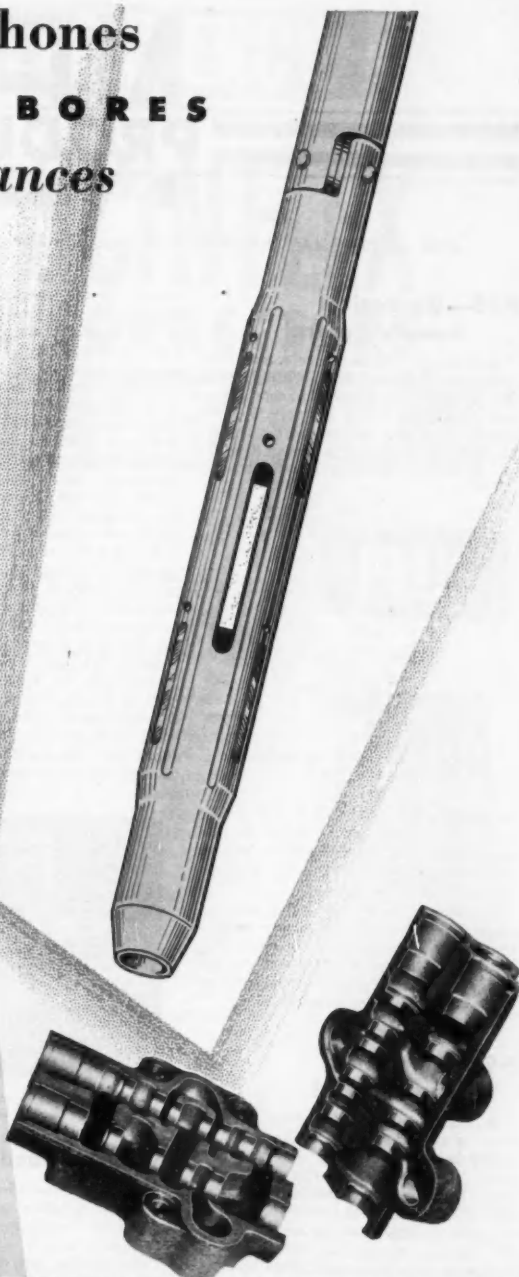
Plastic guides stabilize tool as abrasives cross keyways, undercuts, ports, reliefs, or cross holes.

The guides are forced out radially against the surface by the same cone (wedge) that applies pressure to the abrasives. The plastic wears down with the abrasive and keeps the abrasive generating a true cylinder without injurious over-cutting or breaking the edges of the interruptions in the surfaces.

Lands in cast iron hydraulic control panel held to .0002" for size, roundness, straightness and alignment. No lapping or selective fitting of spools is necessary. Holds 750 lbs. pressure without leakage or binding.



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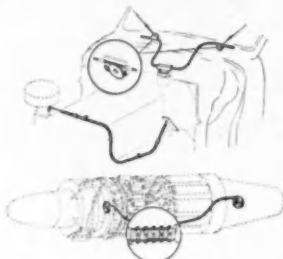
District Field Offices: 1323 S. Santa Fe Avenue, Los Angeles 21, California • 206 S. Main Street, Rockford, Illinois • 231 S. Pendleton Avenue, Pendleton, Indiana • MICRO-MOLD Manufacturing Division, Boston Post Road, Guilford, Connecticut • 55 George Street, Brantford, Ontario, Canada

NEW PRODUCTS

FOR ADDITIONAL INFORMATION regarding any of these items, please use coupon on PAGE 58

F-93—Mechanical Remote Control

Mechanical remote controls, manufactured by Teleflex, Inc., Philadelphia, Pa., are now being used for accelerator and windshield wiper controls in automobiles and for actuation of gas turbine controls. Motion is transmitted by



Teleflex control system for automotive applications.

means of a flexible cable within a conduit. The system can be routed around corners or obstructions and is said to produce excellent results in tension, compression or both.

Teleflex cable has an outer wire of comparatively large diameter wound around the main body of the cable. The outer wire or helix of the cable engages with a specially hobbled wheel when used in control boxes.

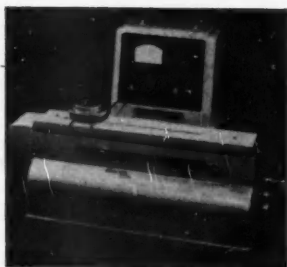
F-94—Electronic Gaging Head

A remote electronic gaging head is now being supplied with the N-6 Internalchek according to an announcement by The Sheffield Corp., Dayton, Ohio. Standard dual amplifications are 1000/2000, 300/3000, 5000/10,000 to one. Other amplifications are available on special order. This instrument is normally used in the tool room or gage laboratory for checking master and working ring gages, setting snap and length gages, for checking tools and other high precision work having one or more internal dimensions. It is also ideal for use where small runs are made of a great variety of bore sizes which have close tolerances. Precision blocks or masters are used as a reference in

setting up the instrument. Both bench type and console base are available.

The Sheffield electronic gage head consists primarily of a highly stabilized a-c vacuum tube circuit which gives indication on a high speed meter. A built-in regulating transformer controls fluctuations of 95-125 v to within one per cent. Elimination of drift in the circuit is said to permit accurate measurements continuously or intermittently, over long periods of time without constant resetting. The scale is linear both sides of zero.

The N-6 has a gaging range from a minimum diameter of .370 in. to a maximum diameter of 12 in. Maximum gaging depth from surface plate to center of diamond point is 1½ in. Capacity of the standard instrument is sufficient to accommodate an A G. D. ring of the largest size. On special order the N-6 may be supplied with gaging arms for checking holes down to and including 0.240 in. diam. The maximum gaging depth from the surface plate to center of diamond points on these arms is one in.



Sheffield bench type unit with electronic gaging head.

F-95—Saw Band

A saw band specifically designed for high-speed friction sawing has been introduced recently by The DoALL Co., Des Plaines, Ill.

Through the use of a special heat treating process the DoALL friction saw band teeth are permanently anchored and locked in place. The metallurgical characteristics of the band enable maximum flexation, resulting in long uninterrupted production sawing.

Typical applications are castings, sheet metal fabrication, tubing, armor plate, high speed cut-off work, and gen-

eral shaping of ferrous material with work thickness ranging up to one in.

DoALL friction saws are offered in three widths, ½ in., ¾ in. and 1 in., 10 or 14 teeth per in.

F-96—Air Controller for Brakes



To synchronize tractor air brakes with electric brakes on a trailer, the Warner Electric Brake & Clutch Co., Beloit, Wis., developed this air controller. With this unit both the tractor and trailer brakes are operated simultaneously with the regular foot pedal in the tractor.

F-97—Dies and Die Holders

P&W Monocone dies and die holders for screw machines and other equipment are now being produced by Pratt & Whitney, Division Niles-Bement-Pond Co., West Hartford, Conn., as companion products to the long-established Duocone line of dies and holders. Introduction of the Monocone tools provides users with a choice of the two types of concentric-adjustment dies—flat-backed and cone-backed—from a single source. The dies may be obtained in screw gage sizes naught through 14 and in fractional sizes from 1/16 in. through 1½ in.

Monocone dies are conical at the nose end only. The flat base is driven by lugs, and is centralized in the holder by tightening the adjusting cap. The Duocone Die is tapered at both ends and is aligned by both the adjusting cap and a conical seat in the holder. It is driven by dowels which engage corresponding notches in the die.

Both dies are otherwise similar in construction. They are made of either

(Turn to page 68, please)

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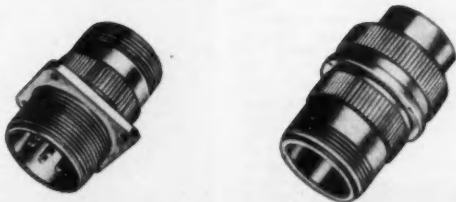
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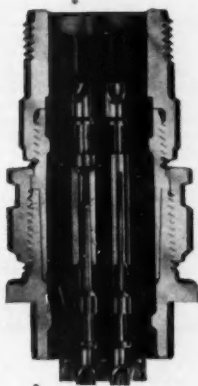
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The ability to carry maximum currents with only a minimum voltage drop is an outstanding characteristic of Bendix Scinflex Electrical Connectors. This important feature is only a part of the story of Bendix success in the electrical connector field. The use of Scinflex dielectric material, an exclusive Bendix development of outstanding stability, increases resistance to flash over and creepage. In temperature extremes, from -67°F. to $+275^{\circ}\text{F.}$ performance is remarkable. Dielectric strength is never less than 300 volts per mil. All in all, no other electrical connector combines as many important exclusive features as you will find in Bendix Scinflex connectors. For higher efficiency in your electrical connectors be sure to specify Bendix Scinflex. Our sales department will gladly furnish additional information on request.



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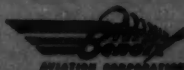
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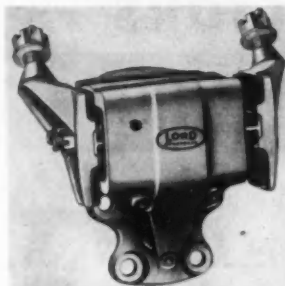


NEW

PRODUCTS for AIRCRAFT

FOR ADDITIONAL INFORMATION regarding any of these items, please use coupon on PAGE 58

S-21—Engine Mounting



A lightweight Dynafocal aircraft engine suspension, known as the MR-41, has been developed by the Lord Mfg. Co., Erie, Pa. Very low natural frequencies make it possible for the MR-41 Dynafocal to isolate a high percentage of engine vibration. The number of component parts in the MR-41 Dynafocal has been minimized. Improved snubbers which offer high damping characteristics are incorporated into the individual mountings to prevent metal-to-metal bottoming during periods of abnormal stress.

S-22—Fuel Tank Filler Cap

Gabb Special Products Div., E. Horton & Son Co., Windsor Locks, Conn., has put on the market an aircraft fuel tank filler cap which utilizes internal tank pressure to assist in sealing. Called the Safe-T-Lock, it is flush mounted and can be opened safely under pressure. When the T-handle is lifted, the lower half of the cap swings inward into the fuel tank—leaving a three in. opening. Developed for high speed aircraft, it can be utilized for pressures up to 100 psi.

S-23—Dehydrator

Increased combustion efficiency, reduced carbon formation and less corrosion of working parts are claimed for internal combustion engines when using fuel dehydrated by a unit produced by Bowser, Inc., Fort Wayne, Ind.

Dehydration is accomplished by passing the fuel through elements which are a combination of wound cellulose cylinders, specially treated coalescing media, perforated metal and glass cloth. With reasonable care the de-

hydrating elements are said to function indefinitely.

Where there is a possibility of large volumes of water in fuel, a hydraulically balanced, automatic ejector is available as an accessory.

Available in capacities of 350 and 600 gpm. Maximum working pressure 125 psi. Shell and cover are heavy-gauge steel. A.S.M.E. code labeled construction.

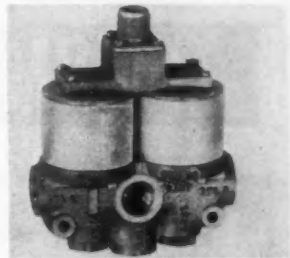
S-24—Coated Fabric

Flexfirm Products, El Monte, Calif., have brought out a nylon-base coated fabric, Aeron 26. The material is for use in aircraft cover applications, such as wings, nose and fuselage covers.

It is a lightweight material with high tear and tensile strength. It passes minus 80 F to 200 F temperature requirements.

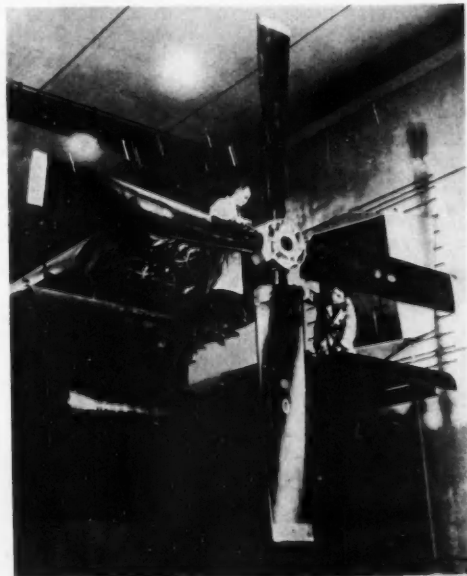
The tensile strength is 170 lb warp and fill the tear strength 15 lb and the fabric weight six ounces.

S-26—Pneumatic Control Valve



Three and four-way solenoid operated valves, thermal relief valves and check valves have been developed by Adel Div., General Metals Corp., Burbank, Calif., for pneumatic control systems in aircraft. Valve illustrated is four-way solenoid operated and is said to provide instantaneous reaction at standard working pressures up to 3000 psi.

S-25—Rubber Filled Propeller

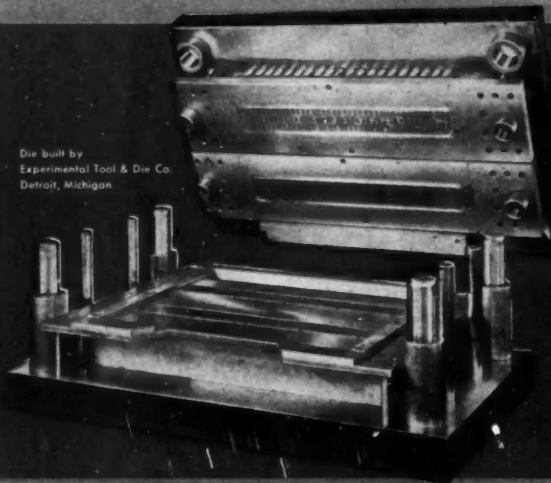


Propellers filled with sponge rubber are in manufacture at the Hamilton Standard Div. of United Aircraft Corp. Hard sponge is used to fill the void between propeller blade core and shell, keeping the latter from vibrating in and out under pressures, and supporting it against the impact of rocks, ice and other material thrown up by the plane's undercarriage. The new filling compound, called HS 160, has three principal components: Hycar OR-15, an oil resistant rubber manufactured by B. F. Goodrich Chemical Co., Cleveland, Ohio; phenolic resin, and nylon.

PIECE PART REJECTIONS REDUCED

Diemakers at Experimental Tool & Die Company solved a costly repair soldering problem on these stamped radiator heads with the die shown below. Precision was the secret. Die tolerances were held to within .0001" and all die components had to be interchangeable. That's why they specified...

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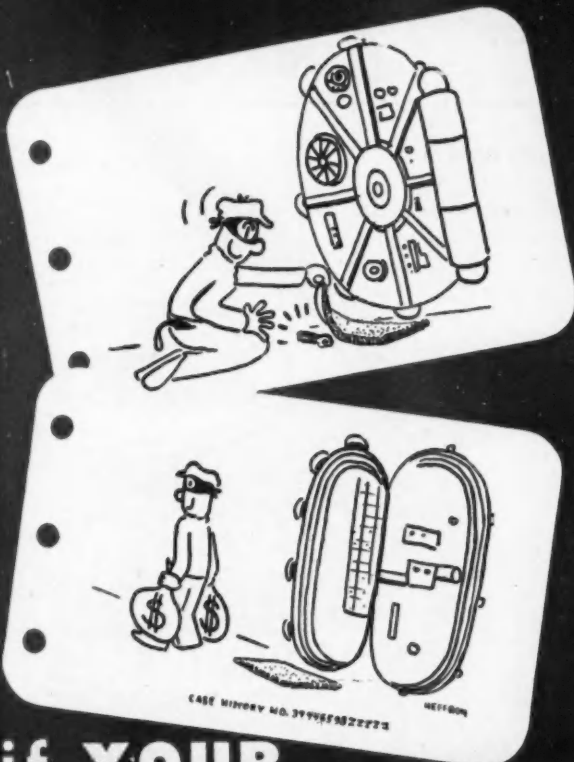


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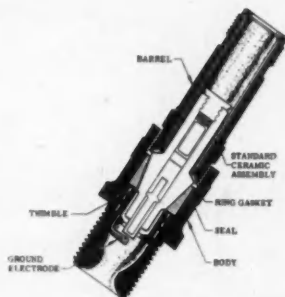
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Anti-Fouling Spark Plug Developed by Boeing

Boeing Airplane Co. has developed an anti-fouling spark plug, which has not yet been placed on the market. Versions of the new plug have been successfully tested in airplane engines, automobiles and outboard motors. Boeing has stated that it took on the project in the interest of aiding anything which might benefit our aircraft from the standpoint of reliability and performance.

Fundamentally, the key to the plug's feature lies in the use of a special pre-combustion chamber. Recessed within the plug's structure, it gives protection to the electrodes and other critical parts.

In addition to anti-fouling, tests on the Boeing plug are said to have resulted in improved starting characteristics, smoother and slower idling, smoother and more rapid acceleration with no increase in fuel consumption, a wide heat range and a greater resistance to breakdown.



This cutaway drawing of the new Boeing Airplane Co. anti-fouling spark plug shows its unique ball-like lower end and unusual cooling chamber. Versions of the new plug have been tested in airplanes, automobiles and outboard motors. It has not yet been placed on the market.

A number of the automotive-type Boeing plug have undergone a total of more than 60,000 miles of service tests in 15 different cars. One car a 1938 model, had piston rings and one cylinder in a condition so bad that standard plugs fouled in 150 to 170 miles. A Boeing plug in this cylinder showed no signs of fouling after 4000 miles, according to the company.

The anti-fouling properties of the new Boeing plug are, if anything, more important to the aircraft engine than to the automobile. Because of the high lead content in certain aircraft fuels, airplane engines are subject to more serious and more rapid fouling than are automobile engines.

In various industrial applications, the new-type plug has been tested sufficiently to satisfy its designers that it will provide dependable, longlife operation in any kind of gasoline engine.

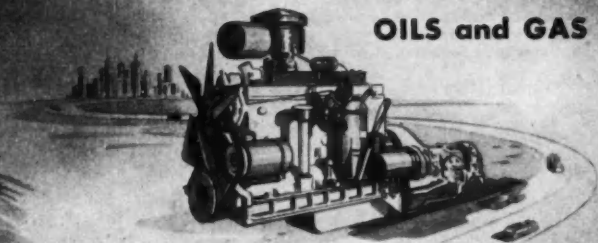
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STALWART-developed rubber compounds are available in mass produced parts to meet your applicational requirements. These parts retain their physical, chemical and dielectric properties regardless of the effects of extreme temperatures, oil and gasoline, chemical action, abrasion and weather.

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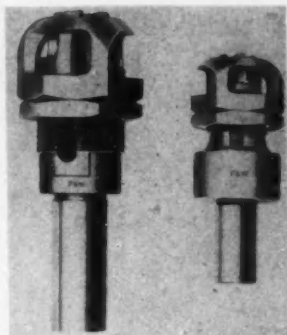
For additional information regarding any of these items, please use coupon on page 58

(Continued from page 62)

high speed or carbon steel as required and are scientifically heat treated to obtain the best combination of hardness

and toughness for long life. A test piece is shipped with each die as evidence of its satisfactory cutting qualities.

Holders for Monocone and Duocone



P & W reversing and releasing die holders.

BALLS FOR BEARINGS AND OTHER BALL APPLICATIONS



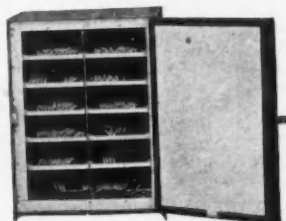
Precision balls made for your job — available in a variety of materials. Your specifications will receive prompt attention in our Engineering Department. We are thoroughly experienced in supplying the automotive industry with special bearings, retainers and balls. Let us give you our recommendations.

THE HARTFORD STEEL BALL CO. HARTFORD 6, CONN.

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CHICAGO: VICTOR H. CLARK, 685 W. WASHINGTON BLVD.
NEWARK, N. J.: GUARANTEE TRUST BLDG., 672 BRAD ST.
LOS ANGELES, CAL.: E. H. WALTON CO., 1718 SOUTH FLOWER ST.
EXPORT: H. A. RODRIGUEZ, INC., 35 W. 42ND ST., NEW YORK

dies are produced in both reversing and releasing types. The reversing holders are designed for use on automatic screw machines and other machines which have positive reversal with minimum lag. Releasing holders are made for such applications as hand screw machines, where the reversing operation is dependent upon the operator. If the spindle is not reversed in time by the worker, the die head disengages and spins with the work so that it does not damage shoulders or collets. When the spindle is reversed, the die automatically drops back into locked position and unscrews from the work.

F-98—Electrode Stabilizer

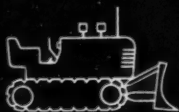
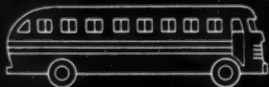


This compact, efficient, moisture-content stabilizer has been introduced which provides the desired protection of low hydrogen welding rods at point of use. It is known as the Blueweld Lo-Hydrogen electrode stabilizer and, according to the manufacturer, Fred C. Archer, Inc., Milwaukee, Wis., is designed "to keep low hydrogen electrodes stabilized. The Blueweld unit stores 400 lb of electrodes and, because of its size and compact design, may be located at any point convenient to the welding operation."

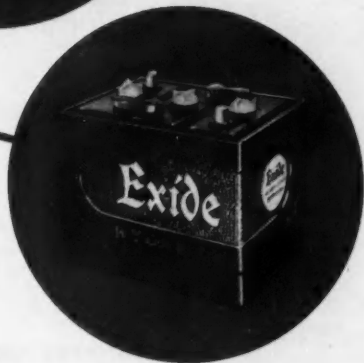
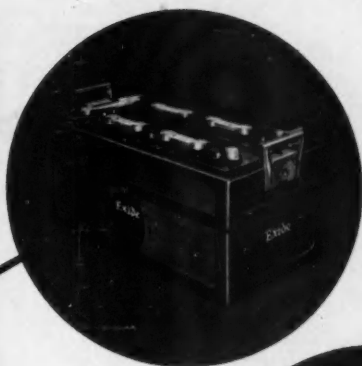
F-99—Lift Truck

Easier accessibility to the engine compartment, a new type parking brake, an instrument panel mounted on the steering column, easier steering and redesign for faster maintenance are features of the improved Clark Gas

(Turn to page 72, please)



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Philadelphia 2

Exide Batteries of Canada, Limited, Toronto

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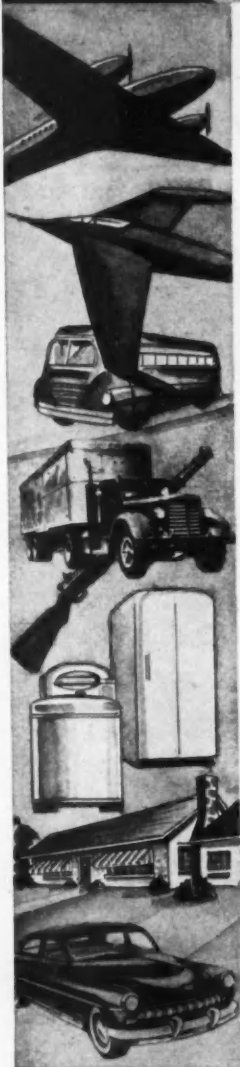
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AUTOMOTIVE INDUSTRIES, November 1, 1951



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"GRANODINE"® forms a zinc-iron phosphate-coating bond on sheet metal products—automobile bodies and fenders, refrigerator cabinets, etc.—for a durable, lustrous paint finish.

"LITHOFORM"® makes paint stick to galvanized iron and other zinc and cadmium surfaces.

"ALODINE"®, the new ACP protective coating chemical for aluminum, anchors the paint finish and protects the metal.

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"PERMADINE"®, a zinc phosphate coating chemical, forms on steel an oil-adsorptive coating which bonds rust-inhibiting oils such as "Granoleum."

"THERMOIL-GRANODINE"® a manganese-iron phosphate coating chemical, forms on steel a dense crystalline coating which, when oiled or painted, inhibits corrosion.

PROTECTION FOR FRICTION SURFACES

The oiled "THERMOIL-GRANODINE" coating on pistons, piston rings, cranks, camshafts and other rubbing parts, allows safe break-in operation, eliminates metal-to-metal contact, maintains lubrication and reduces the danger of scuffing, scoring, galling, welding and tearing.

IMPROVED DRAWING AND COLD FORMING

"GRANODRAW"® forms on pickled surfaces a tightly-bound adherent, zinc-iron phosphate coating which facilitates the cold mechanical deformation of steel, improves drawing, and lengthens die life.

Send for descriptive folders and Government specifications chart on the above chemicals. Write or call for more information on these products, and advice on your own metal-working problem.

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AMERICAN CHEMICAL PAINT COMPANY
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Manufacturers of Metallurgical, Agricultural and Pharmaceutical Chemicals

The Machinery Industry

(Continued from page 56)

form of symbols, or in dollar appraisal, the annual appearance would inform the investor of the degree of efficiency with which the productive equipment was being maintained.

"Thus, by a means of providing investors and creditors information, to which they are entitled, about the degree of protection given their holdings by the competitive efficiency of a company's productive equipment, a more appreciable attitude would be fostered toward appropriations for necessary equipment replacements and additions. The effects of this attitude would be those expected from a faster and more constant movement of modern cost-cutting equipment into industry. And it is a certain conclusion that the present problem of obsolescence in the metal-working industry would be well on the way to a satisfactory solution."

Fast Delivery

Foreign machine tool builders that exhibited their equipment at the Metal Show in Detroit were reportedly telling prospective purchasers that any make and model tool could be delivered within eight to 10 months. Another interesting item stemming from the foreign builders is that some of them had slightly used machine tools on which delivery could be made immediately.

New NPA Director

Swan Bergstrom is on leave as vice-president and director of Cincinnati Milling Machine Co. to take over the Directorship of the NPA Metalworking Equipment Division.


Manufacturers of portable pneumatic tools claim that if they are forced to cut back production during the first quarter of 1952, they will require several months to return to the current rate of production.

RF Heating Equipment

According to J. G. Sola, president, Sola Electric Co., total RF heating units installed in American factories now have an operating capacity in excess of 500,000 kw, representing an investment of more than \$75 million. He pointed out that more than 55 per cent of this capacity has been installed within the last 10 years, although RF heating equipment has been commercially available since the early 1920's.

Defense Presses

The Elmes Engineering Div. of American Steel Foundries has recently manufactured a battery of five hydraulic gas-check presses for the U. S. Navy. To be used for defense work, the presses are of the C-frame type with a double action ram.



**OPEN
THE
DOOR**

**...TO MORE
DEFENSE PRODUCTION
CAPACITY OVERNIGHT**

Here at Harter is a progressive, busy plant ready to go to work for you *now*. Here are the *modern* production equipment, the experienced management and the skilled labor force you want in a subcontractor. Location on major railroads and truck lines speeds delivery. Harter offers, also, the design skill and tooling facilities needed to start actual production on your product *fast*.

Harter's reputation as the top manufacturer of quality steel office chairs and its record as a dependable subcontractor are your assurance that your order will be delivered on time and to specifications.

Write Harter Corporation or phone Sturgis 781 for complete information on Harter's metal forming and fabrication facilities. Harter Corporation, 911 Prairie Avenue, Sturgis, Michigan.



HARTER STEEL POSTURE CHAIRS
STURGIS, MICHIGAN

NEW PRODUCTS

For additional information regarding any of these items, please use coupon on page 58

(Continued from page 68)

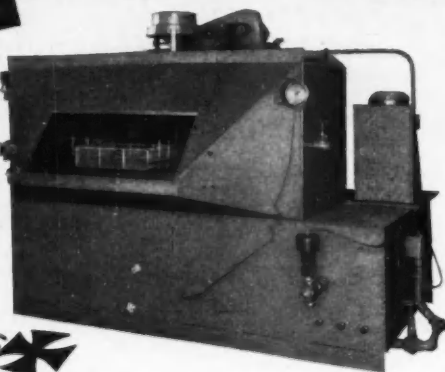
Clipper, put out by Clark Equipment Co., Battle Creek, Mich.

An instrument panel is now standard

equipment on all Clippers. Recessed into the dash on the models is the Protectosol gas cap, completely outside of engine compartment. A new pull-type brake replaces the hand brake

ONE MAN OPERATION with BLAKESLEE METAL PARTS WASHERS

ONE SPOT
LOAD and
UNLOAD



**BLAKESLEE
SOLVENT VAPOR
DEGREASERS**
—economical, efficient—
USE LESS SOLVENT

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Solvent — one price,
one solvent for all metals

**Blakeslee's new washer
saves labor, is economical**

Just one man can keep the production line going with this time saving metal parts washer. Turn table operation permits loading and unloading in one easy pivot movement. One revolution of the washer turn table and parts come out sparkling clean for a better finishing job with fewer rejects. Blakeslee washers are designed for every type and size of plant operation. Write for the cooperative services of our engineer-trained sales representatives.

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on previous models. It is at the extreme corner of the floor board, clearing the center area of the floor plate.

No-Kick-Back steering is achieved by the use of an Elliot-type axle with the tie rods in the same plane and more nearly in line with the forces they transmit, plus relocation of steering knuckles as close to the tire's dead-center shock point as is practical. Better riding is achieved through the use of cushion tires on all models and rubber torsional bushings at pivot mounting points. Redesigned double cylinder tilt system gives better upright stability with a smoother, more positive control tilt.

A "quick-change" clutch has been adapted to minimize "down time" if changing of clutch becomes necessary. Unscrewing two bolts and disengaging the accelerator pedal allows fast accessibility to the clutch housing.

F-100—Synchronous Motor

A small synchronous motor has been placed on the market by Allis-Chalmers Mfg. Co., Milwaukee, Wis. The motor operates on the reluctance principle. It can be built to operate continuously at any voltage below 250 v, either single phase or polyphase, and should interest designers of control systems, instrumentation, and military and industrial equipment.

A typical motor is four in. dia by 2½-in. long, weighs 2.6 lb, and develops eight oz.-in. starting torque and 0.8 oz.-in. synchronous torque. The motor is able to start and pull into step at any frequency from 10 to 400 cycles.

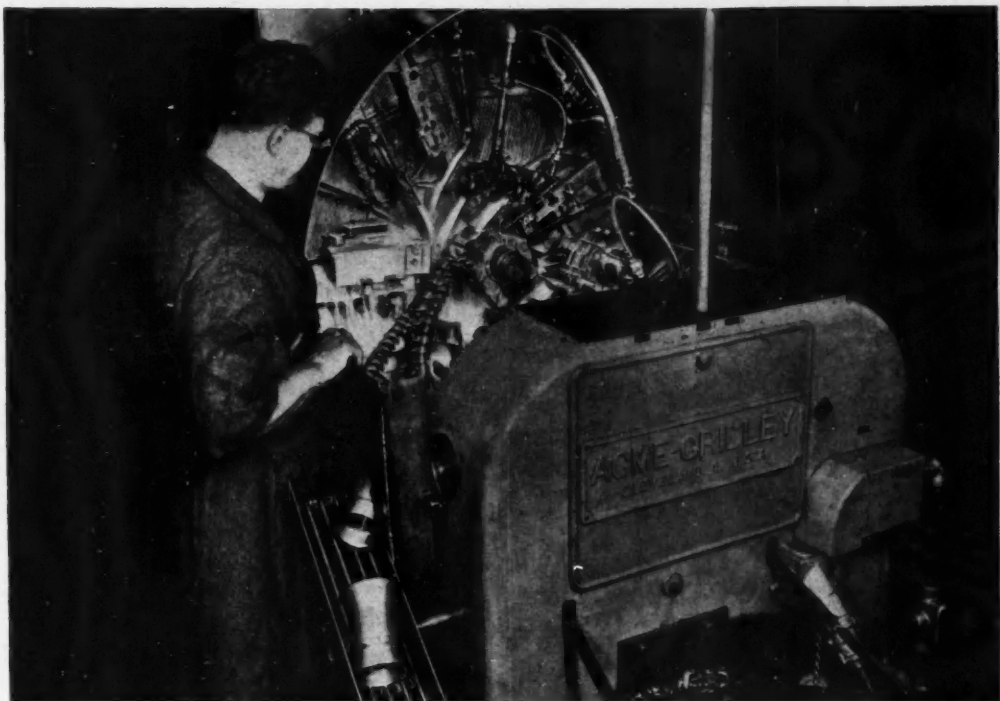
F-101—Filler-Metal Welding

Fillerweld, a product designed to speed alloy-metal welding on applications where filler-metal must be added, has been announced by General Electric Co., Schenectady, N. Y.

Used with gas-shielded arc welders, Fillerweld allows the operator to control the continuous flow of filler-metal automatically by means of a finger switch mounted on the torch. According to G-E engineers, the new welding attachment allows the operator to start or stop the flow of filler metal without breaking the arc.

It consists of two main elements—the torch or gun, and a mechanical power unit. The gun is basically a manual water-cooled inert-arc tungsten holder to which has been added a control switch, and a gear assembly for pulling the filler-metal from the spool to the arc through the gun. Rated at 250 amperes, the gun accommodates tungsten from 0.040 to 5/32-in. in diam and up to seven in. long.

The mechanical power unit consists of a motor which provides the power for drawing the filler-metal, a Thy-mot unit for controlling the motor, and a spool which holds the filler wire.



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We can help you cut machining costs on munitions parts.

National Acme engineers have worked out standardized tooling and production methods for many of them, taking advantage of the faster setup and machining times possible on the versatile, new Acme-Gridley Model M Single Spindle Automatic. That way, you're ready to go right into

production with no educational orders, trial set-ups or experimental tooling.

So you start out with a saving—and you'll save through the heavier feeds, faster speeds and closer tolerances you get on a Model M. You can have the advantage of faster production through fully automatic operation on a broad variety of parts and lot sizes. On the job illustrated, for example, machining time was cut 50%, using exceptionally heavy feeds and faster speeds.

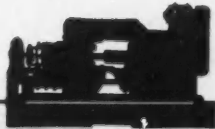
Interested? Let us show you how the Model M can raise production—and profits—in your plant.

JOB FACTS

PART:	Collet Blank
MATERIAL:	A-4160 Steel
MACHINE:	4 $\frac{3}{4}$ " Acme-Gridley Model M Single Spindle Automatic
OPERATIONS:	14, including heavy drilling, light forming and turn and finish bore.
TOOLS:	Carbide and High Speed Steel
TIME:	17 Minutes
SAVING:	Machining time cut 50%

THE NATIONAL ACME COMPANY

170 EAST 131st STREET • CLEVELAND 8, OHIO



ACME-GRIDLEY BAR and CHUCKING AUTOMATICS built in 1, 4, 6 and 8 spindle styles, maintain accuracy at the highest spindle speeds and fastest feeds modern cutting tools can withstand.



Life-linestarter
PAIRED FOR PRODUCTION
Life-line motor



Mass Production ?

Assures schedules two ways

When motors—or their controls—go out, they usually go one at a time. One outage, though, may cripple an entire line. And whether you are producing spark plugs, automobiles or tanks, down time means lost production time. Take just a minute, then, to consider the extra "Life" features of Life-Line motors and Life-Linestarters®. They have the stamina to keep equipment operating under adverse conditions.

Consider the motor, for example. Heavy steel frame resists corrosion, vibration and physical shock. And inside? The wound stator is completely protected with multiple baked coats of tough thermoset varnish to cut outages from oil, moisture, dirt and heat.

And, too, Life-Line motors need no lubrication. Factory-sealed, pre-lubricated bearings reduce motor burnouts—no danger of over-or-under-lubrication as with conventional motors. Down time licked again.

Life-Linestarter, the Life-Line motor's rugged

partner, provides positive protection on the toughest assignments. Designed specifically to meet the requirements of the Joint Industrial Committee of Automotive Manufacturers (JICAM), the combination Life-Linestarter in NEMA XII enclosure is provided with a dual-voltage primary transformer for operation on either 220 or 440 volts. The rubber-gasketed, no-knock-out enclosure excludes dirt, oil and splashing coolant.

Simple design, simple operation, mean fewer operating parts to foul. Seesaw action of clapper prevents accidental operation, kickout spring assures positive opening. The pace setter among starters, Life-Linestarter assures the dependable performance you need.

More data? Ask your Westinghouse representative for "Life-Line Motor Book" B-3842 and "Tomorrow's Starter Today" B-4677, or write direct to Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Penna. J-31640

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DEFENSE TIME
EVERY TIME

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Welded Mechanical Steel Tubing



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"Standard"
—IT PAYS!

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Detroit 28, Michigan

Welded Tubing Fabricated Parts

STANDARDIZE with STANDARD — IT PAYS

CARBON STEEL TUBING
1/2" O.D. to 5 1/2" O.D.
.028 to .260 wall



STAINLESS STEEL TUBING
3/8" O.D. to 3" O.D.
.028 to .095 wall

Industry News

(Continued from page 24)

hour ratings of motor vehicle, light aircraft, and small boat batteries.

Available supplies of lead this year will fall short of 1950 actual consumption by from 20 to 25 per cent. This means that there will be a shortage of about 300,000 tons. Supplies are being doled out on a month-to-month allocation basis. Specifically, battery needs for this year were put at 27 million units—of which 22 million are needed for replacements. Total production during the first half amounted to less than 9 million units. Output will be substantially larger for the second half, the traditional big production period, but there is doubt that all requirements can be met.

Jamestown Metal Opens New Plant

The Jamestown Metal Corp., Jamestown, N. Y., producer of interior trim for automobiles, has formally opened its new plant which will eventually employ nearly 300 persons. The plant is 600 ft long and 320 ft wide.

Nominate Gorrie for Chairman of NSRB

Jack O. Gorrie, a former Seattle, Wash., newspaperman, has been nominated by President Truman to be chairman of the National Security Resources Board. He has been acting NSRB chairman since April, when W. Stuart Symington resigned to become head of the Reconstruction Finance Corp.

GM Publishes Book To Aid Suppliers

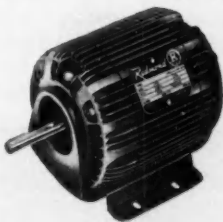
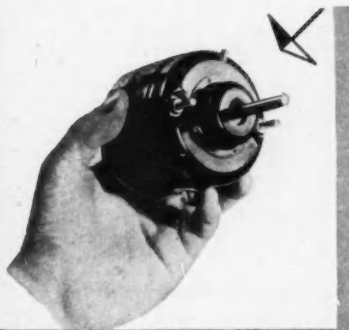
GM is distributing a new booklet designed to improve liaison between present vendors and other small businesses which are potential suppliers. It contains a directory of the 39 GM manufacturing divisions with a detailed alphabetical listing of the civilian and defense products made by each. It suggests that companies wishing to do business with GM get in touch with purchasing departments of GM units which they believe they can serve. Companies who are uncertain as to where to write are advised to get in touch with a new central clearing house for supplier information, the GM Procurement and Schedules Department, Room 14-262 General Motors Building, Detroit 2, Mich., which will refer the inquiry to the proper source or inform the supplier where to write. GM currently has more than 12,000 suppliers and during World War II had about 19,000.

(Turn to page 116, please)

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DYNAMOTORS, WINDSHIELD WIPERS
and other
SPECIAL EQUIPMENT
for
**MILITARY
REQUIREMENTS**



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THE BIG NAME IN SMALL MOTORS



METALS

(Continued from page 54)

ceiling had been raised to restore the normal differential, and manufacturers of lead products halted deliveries pending action by OPS on new ceilings to reflect the advance in refined lead.

Mexican mines, which are producing about 17,000 tons of refined lead per month, declared flatly they would continue to ship to Europe at 21½ cents a pound, for as long as European demand held up. They asserted, perhaps

with justice, that they had to take care of their European buyers because in the past they had often been shut out of U. S. markets by our protective tariff.

However, some doubt was expressed that European demand would be sufficient to take the entire Mexican output and if the price declined to 19 cents, the metal again would come to the U. S.

If the Government consents to release lead to industry from the stockpile, which is believed to be ample, it is a pretty good bet that the price can be held at 19 cents until European demand moderates. Lead at 19 cents a

pound appears to be amply priced and in 1949 collapsed badly after holding there for a short time.

Copper Production Down

The September copper statistics reflected results of the strikes in earlier months. Crude output was slightly higher than in August but much below the monthly average for the year. Secondary production of only 1600 tons was almost negligible, indicating that scrap is not coming to the primary smelters and probably won't until a higher ceiling price is set. Refined copper production slumped to 74,000 tons because of the time lag in converting blister to electrolytic. Deliveries of electrolytic mounted to 121,600 tons, highest for the year, but these included some of the metal released from the stockpile by the Government. As a result of high deliveries, stocks of copper held by producers dropped to 62,000 tons.

More electrolytic copper will be available later in the year as large tonnages of copper concentrates from Utah are processed. These concentrates accumulated when the smelters were strike-bound and will be a welcome addition to normal output.

The dual price for copper of 24½ cents for domestic and 27½ cents for foreign copper appears to satisfy the Government, however confusing it may be to industry. Government officials declare that a higher price for domestic copper would not bring out any additional metal and quite likely they are right in this. But as long as Europe continues to bid far above 27½ cents a pound for copper it won't enter the country in the volume wanted. Western Germany has agreed to take the output of a small government owned copper smelter in Chile at 57 cents a pound, which readily explains Chile's adamant refusal to release its 20 per cent reserved production to the United States at 27½ cents a pound.

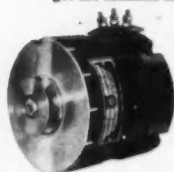
Aluminum Outlook Hopeful

Among the major metals aluminum production alone appears to be progressing on schedule and at the present indicated rate should reach the goal of about 1,300,000 tons annual output by June, 1952. The threatened power shortage in the northwest that might have curtailed output seems to be over. While aluminum still is in short supply, the outlook is definitely hopeful. The Government has evidently decided it can afford to defer stockpiling the metal at the rate of 10-20,000 tons a month for the balance of the fourth quarter and perhaps for the first quarter of 1952, and this tonnage will be released to industry.

The spectacular progress made in aluminum output contrasts sharply with the drab showing in domestic production of copper, lead, and zinc. Pre-Korean production of aluminum was

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L-N ALTERNATOR SYSTEMS

Include dry-plate rectifier. Capacities from 50 to 175 amps. for 6, 12, 24, 32 volt systems.

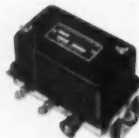


L-N LOW-CUT-IN DC GENERATORS

60 to 2100 watts. Types available for all requirements.

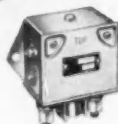
L-N CRANKING MOTORS

Heavy-duty construction for quick, dependable starting. ½ HP to 27 HP.



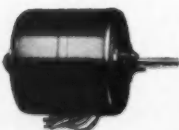
L-N REGULATORS

Patented, double-contact, long-life design, hold voltages to close limits.



L-N SWITCHES

Hand and magnetic for standard and series-parallel systems.



L-N FRACTIONAL HP MOTORS

Standard production includes ¾" to 1½" stack, for 6 or 12 volts. Other designs and voltages available.

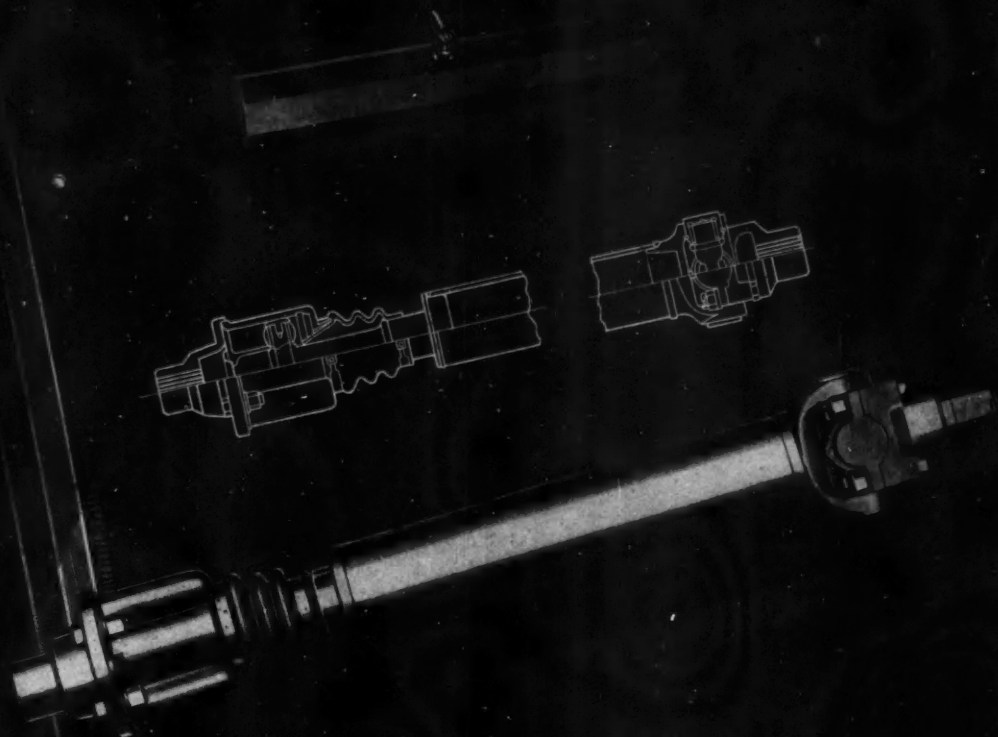


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The development of the DETROIT ball and trunnion universal joint has made possible extraordinary improvements in propeller shaft operation. Anti-friction slip motion, angular motion and length changes are accomplished without spline friction. Thus thrust load on transmission and axle bearings is minimized. Result: longer life for the entire drive train . . . and a better riding automobile*.

* Two types are available—the ball and trunnion combined with the cross type universal joint, as illustrated above, or the ball and trunnion at both ends.

Detroit



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LEDEX ROTARY SOLENOIDS



The powerful rotary action of LEXEDY Solenoids is at work delivering dependable operation in a multitude of products. LEXEDY engineers will work with you to provide the most efficient applications of LEXEDY Rotary Solenoids for your products.

Available in six sizes... rotary strokes up to 7/8" ... 2000 cycles per hour to 50 pounds-inches... with many types of power linkages. Write today for complete information.

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720,000 tons a year. The 1952 output will be nearly double, and if the new 100,000 ton expansion by Kaiser goes through it will bring the annual national production to 1,470,000 tons in 1953. Incidentally, this latest proposed addition may not bring Government support through a price guarantee over the next five years as has been done heretofore.

It is hard to become worried over the domestic aluminum supply if industry can carry on for the next six months. The anticipated output in 1952 of 1,300,000 tons would cover normal civilian consumption at the 1949 per capita rate and still allow over 300,000 tons for the military. It would be more than twice the average yearly consumption in the four years 1946-49. In addition, Aluminum Ltd. of Canada is planning an enormous expansion in production and will certainly look to the U. S. as a major market for its output.

Tin Price Uncertain

The dual price for tin of \$1.12 a pound to Bolivian producers and \$1.03 for the rest of the world continues to cause bitterness among tin producers who claim that the RFC, which controls sales and purchases of the metal in U. S., is no more than a Government buying cartel. There is no doubt that the agency has been successful in arbitrarily setting the price and making it stick. Representing the world's largest tin consumer, the RFC is in an excellent position to dictate the price it will pay. However, its willingness to pay high-cost Bolivian mines nine cents a lb more than to the Malayan mines suggests that a higher price than \$1.03 may be in the offing for the others. This was reflected in the price of tin futures in London and Singapore which climbed to the equivalent of \$1.20 a lb. A runaway tin market, however, is not in prospect. An RFC official declares that the present U. S. tin stockpile is very large.

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Automotive Gaskets

ANOTHER LOGICAL APPLICATION OF

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THE trend to higher compression ratios demands *more strength* in automotive gaskets, with continued resistance to corrosion. Designers with eyes to the future are planning wider eventual use of SuVeneer Clad Metal in this and many other applications . . . because of its strong inner core of strip steel with solid copper bonded inseparably to one or both sides, making a new and better material for tomorrow's finer products!

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CORPORATION

CARNEGIE, PENNSYLVANIA

B. F. Goodrich Chemical Company raw materials

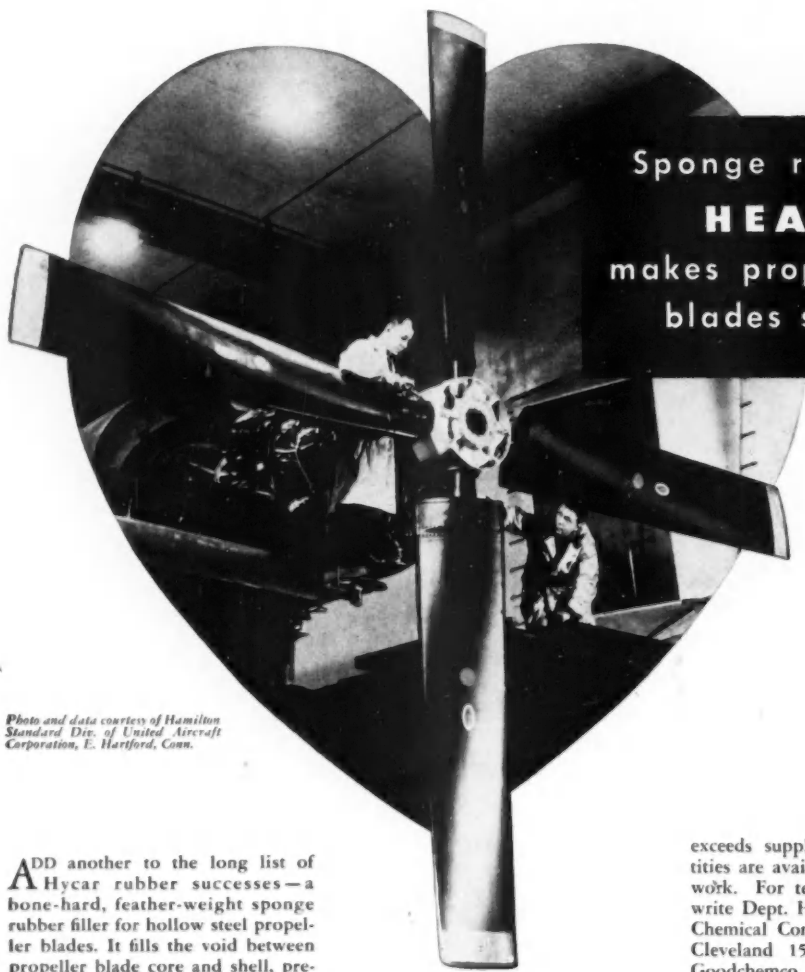


Photo and data courtesy of Hamilton Standard Div. of United Aircraft Corporation, E. Hartford, Conn.

Sponge rubber
HEART
makes propeller
blades stronger!

ADD another to the long list of Hycar rubber successes—a bone-hard, feather-weight sponge rubber filler for hollow steel propeller blades. It fills the void between propeller blade core and shell, prevents the shell from vibrating in and out. It also supports the shell against the impact of rocks, ice and other material thrown up by the plane's undercarriage.

To find this filler took several years of search and tests of nearly a thousand rubber compounds. The winner contained phenolic resin, nylon, and an oil-resistant Hycar rubber compound. The presence of Hycar gives added toughness to the phenolic-nylon blend.

Hycar nitrile rubber's versatility helped make this new material possible. For Hycar has high resistance to heat, cold, cooling liquids, gas, weather and wear. It has excellent compression set characteristics, good aging properties and low moisture vapor permeability.

Hycar's advantages make it ideal for many civilian and defense products—in developing entirely new ones. Right now demand for Hycar

exceeds supply, but limited quantities are available for development work. For technical advice, please write Dept. HD-11, B. F. Goodrich Chemical Company, Rose Building, Cleveland 15, O. Cable address: Goodchemco.

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Need extreme temperature resistance? Hycar has it—plus abrasion resistance and more advantages.

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American Rubber

GEON polyvinyl materials • Hycar American rubber • GOOD-RITE chemicals and plasticizers
HARMON organic colors

CALENDAR

OF COMING SHOWS AND MEETINGS

National Tool & Die Manufacturers,
St. Louis, Mo.Nov. 1-4
American Petroleum Institute (31st
Annual Meeting), Chicago, Ill.
Nov. 5-8
Second Annual Motorama, Los An-
geles, Calif.Nov. 7-11
American Society of Mechanical En-
gineers (annual meeting), Atlantic
City, N. J.Nov. 25-30
Ninth Annual Pittsburgh Diffraction
ConferenceNov. 29-30
Motor and Equipment Wholesalers
Ass'n (Annual Convention) Chi-
cago, Ill.Dec. 3, 4, 5

1952

Brussels Automobile & Truck Show,
Brussels, BelgiumJan. 19-30
42nd National Motor Boat Show,
New York CityJan. 11-19
Plant Maintenance Show, Phila.,
Pa.Jan. 14-17
SAE Annual Meeting, Detroit,
Mich.Jan. 14-18
Society of Plastics Engineers, Inc.
(eighth annual technical confer-
ence), Chicago, Ill.Jan. 16-18
National Transport Vehicle Show &
Fleet Maintenance Exposition,
New YorkFeb. 26-28
Pacific Automotive Show, Los An-
geles, Calif.Feb. 28-Mar. 2
ASTM Spring Meeting, Cleveland,
OhioMar. 3-7
Fifth National Plastics Exposition,
Phila., Pa.Mar. 11-14
ASTE Industrial Exposition, Chicago,
Ill.Mar. 17-21
Geneva Automobile & Truck Show,
Geneva, SwitzerlandMar. 20-30
American Society of Lubrication En-
gineers, Seventh Annual Meeting
and Lubrication Show Cleveland,
OhioApr. 7, 8, 9
Western Highway Institute, Palm
Springs, Calif.Apr. 17-19
API Div. of Refining, San Francisco,
Calif.May 12-15
American Society for Quality Con-
trol (sixth annual meeting),
Syracuse, N. Y.May 22-24
American Society for Testing Ma-
terials (annual meeting) New
York CityJune 23-27

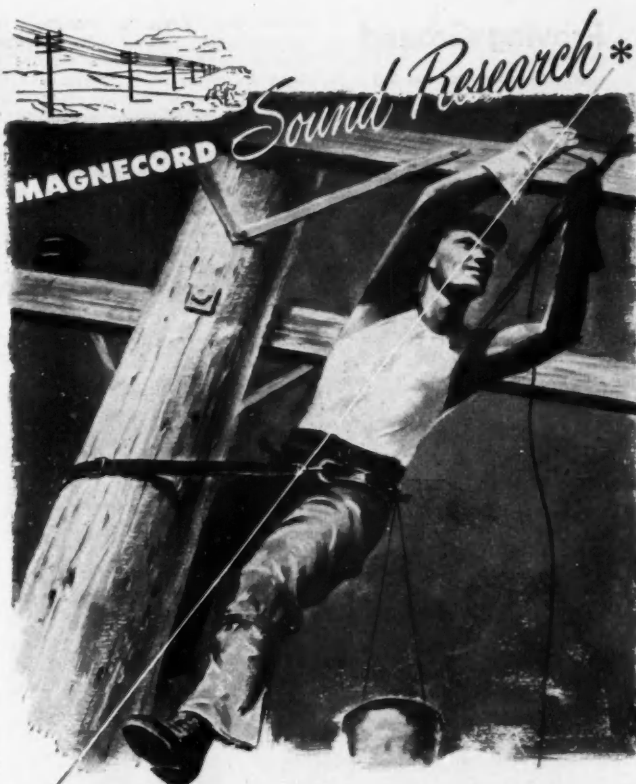
Deburring

(Continued from page 53)

parts is done in a matter of a 20-min run.

Barrels are then flushed out and the parts are unloaded by using a small basket (Fig. 6) that hooks into the bottom of the door opening. This is filled by inching the barrel and avoids letting the parts drop onto a screen. They are taken from the basket by hand and are laid in trays, as in Fig. 6. Chips fall or

(Turn to page 86, please)



* TROUBLE-SHOOTS A POWER LINE

Giant transmission lines require constant maintenance and replacement. Magnecord Tape Recorders help in this full-time job by checking the hum of high voltage transformers. Magnecord sound analysis of this hum pin-points trouble spots along miles of power lines . . . cuts maintenance costs and assures safe delivery of r.p.d. power.

Whatever your recording problem — in the laboratory or in field tests — Magneorders offer greater fidelity and precision. Available for subsonic, audio and supersonic research, Magnecord can fill your most exacting requirements.

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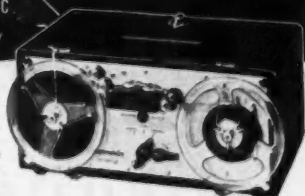
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Send me further information on Magnecord tape recording for industrial "Sound" Research.

Name.....
Company.....
Address.....
City..... Zone..... State.....



CONSERVE
MATERIALS

Proving Ground

(Continued from page 33)

possible modification before the new models are released for production and distribution.

The Phoenix proving ground, with its colorful setting in the desert country, was selected on a site comprising some six and one-half square miles of natural terrain, taking advantage of natural hills which provide the grades and curves. Facilities include a paved track, 28 feet wide, 7¼

miles long. From the standpoint of management economy this operation represents a cooperative venture of both the motor truck division and the industrial power division of the company. Since the latter needed facilities for testing International crawler tractors and construction equipment, this project provided useful engineering construction of roadways, enormous fills, drainage facilities, and other features. Thus, instead of using valuable equipment merely for practice and waste effort the company was able to employ it gainfully in building the proving ground.

The paved highway stretch has attracted the interest of the Arizona State Highway Department since it has some unusual features of construction and is designed for axle loading of 22,500 lb per axle and speeds up to 90 mph. Part of the interest lies in the manner in which fill material was handled. Usually this material is wet down, then compacted. In this case the fill, composed of caliche and rock was put down dry, the scrapers providing pneumatic compaction. It is claimed that compaction averaging around 94 per cent has been achieved, compared with 85 to 90 per cent in conventional practice.

The comprehensive motor truck service shop included in the setup, contains a machine shop, engine reconditioning area, chassis dynamometer, engine dynamometer, and two hydraulic lifts, one of which can handle three-axle vehicles. The shop provides service facilities for a fleet of 35 trucks.

Supplementing the big paved test track, the proving ground also includes a rough four-mile dirt test track, 11 miles of access roads, and other special test areas. The latter includes a special course for "Figure-8" testing, which provides valuable information as to the behavior of front end parts, tires, suspension, etc.; and a series of steep grades for testing off-highway vehicles. Air cleaner tests are made in an area said to have the most abrasive sand and dust in the USA. In addition, there is a 5900-ft strip of "dead flat" 40-ft paving on the test loop for testing cooling, braking, and acceleration characteristics.

The unique climatic conditions at Phoenix make possible the operation of vehicles around the clock every day of the year in an ambient temperature around 100 F, sometimes rising to 118 F. For high altitude and cold weather testing vehicles are driven to 10,000-ft elevation mountain ranges only a few hours' drive to the north. Minimum elevation of the proving ground is 1200 ft while the highest point is about 2000 ft.

With the opening of the paved test track, the fleet has averaged about 34,000 miles per week. The truck testing program of IHC now totals more than 3-million miles a year.

Besides offering ideal facilities for testing trucks right off the production lines, and new experimental models, the Phoenix proving ground also provides an ideal setting for proving truck components—axles, transmissions, suspension, engines, air cleaners, carburetors—in fact everything that makes up a heavy duty vehicle. Moreover, as the story of this operation becomes more widely known, it should offer an excellent opportunity for testing heavy duty tires since IHC is very much interested in cooperative testing with the various tire producers.



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70
YEARS

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has solved many equipment
problems requiring special
SPRINGS

Since 1890 Tuthill has specialized in designing springs to fit every specific need. Whether your spring requirements are for trucks, buses, automobiles, power shovels, farm wagons or dual and triple axle heavy-duty jobs—Tuthill can meet them quickly and economically. And now, **MOLYBDENUM DISULPHIDE (MoS₂)**... the newest Tuthill extra that keeps springs from squeaking and galling, is an added Tuthill feature that distinguishes this famous line.

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WITH THE H-W *Dual* THREAD COMPARATOR

As a companion to our Standard Thread Comparator, Hanson-Whitney now introduces the DUAL Unit. A new anvil design consists of two threaded "holes" or gaging positions that give the inspector 100% more accurate check of external threads.

1. FULL THREADED GAGING POSITION checks lead, angle and pitch diameter cumulatively for accurate test of assemble-ability.
2. 2-THREAD GAGING POSITION spot checks for suspected lead and angle errors which could easily consume a great part of pitch diameter tolerance on close fitting threading jobs. This position will also detect pitch diameter taper on long or extremely short thread lengths.

Three unit sizes available for checking NC, UNC, NF, UNF, and NS threads up to 1½" diameter. All readings taken on one dial indicator to accepted ring gage tolerances, eliminating the human error-possibility of "feel."

For fast, precise gaging at machine or on inspector's bench, investigate the DUAL. Ask for detailed Data Sheet.

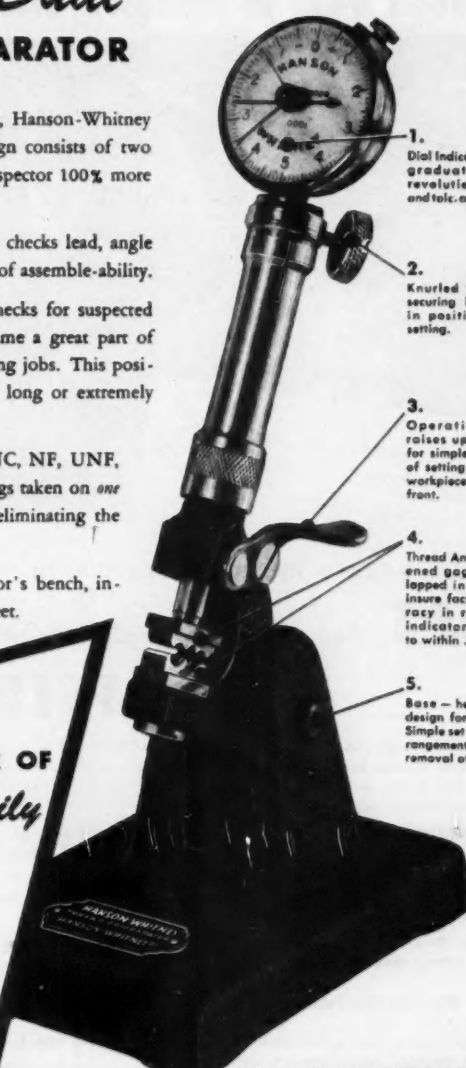
1. Dial Indicator, .0001 graduation with revolution counter and telescopic hands.

2. Knurled knob for securing indicator in position after setting.

3. Operating Lever raises upper anvil for simple insertion of setting plug and workpieces from the front.

4. Thread Anvils hard-ened gage steel, lapped in place to insure factory accuracy in recording indicator readings to within .0002".

5. Base - heavy duty design for stability. Simple set screw arrangement for easy removal of unit.



HANSON-WHITNEY COMPANY

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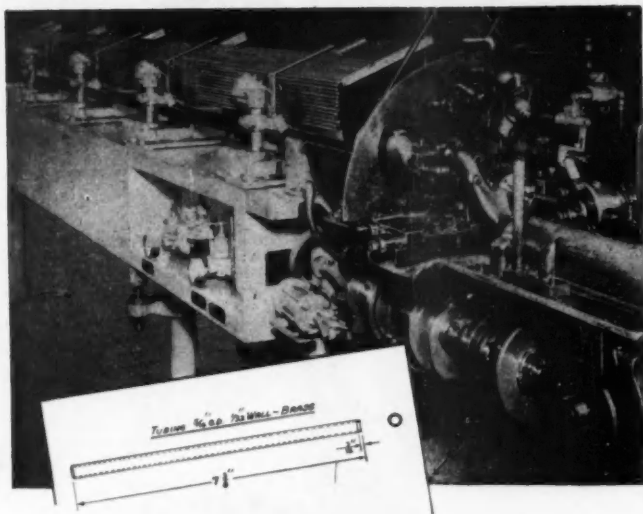
DIVISION OF THE WHITNEY CHAIN COMPANY



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Produces 94% of Increased Gross!



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LIPE *Automatic Magazine Loading*
BAR FEED

THE LESSON—By feeding stock through the collet much faster, Lipe Automatic Bar Feeds increase production on the great majority of screw machine work pieces.

BIG Production Gains on a wide variety of work, BECAUSE—

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Lipe - ROLLWAY CORPORATION

Manufacturers of Automotive Clutches and Machine Tools
Syracuse 1, N. Y.

Deburring

(Continued from page 83)

are dumped into the pan below. Use of this basket cuts unloading time by 30 per cent because operators do not have to reach into the barrel. Total actual time, for tumbling, including handling as above, is 0.35 min per piece for one of the aluminum parts deburred by this process.

Among bronze parts that are deburred are synchronizer blocker rings that have external teeth and a 40-pitch thread in a tapered central hole. These parts average about 2½ in. OD and ½ in. thick. A typical load includes 1400 pieces, 800 lb of No. 4½ synthetic bonded abrasive chips, one lb of No. 255 Roto-Finish compound and water to cover the load. These parts are rolled for one hour at 17 rpm in a 36-in. rubber lined barrel.

When pieces are unloaded by hand, most if not all chips remain in the barrel and do not require rehandling between charges. When handling is needed, it is done in pans like that in Fig. 7, which are shifted by an electric hoist hanging from a light crane beam that runs the length of the barrel line. These pans have nose openings that enter the barrel opening so that a full load of chips can be dumped by tilting the pan. Pans are then placed below barrels and, when barrel loads are dumped, often are used to support a hand screen through which chips sift, leaving parts on the screen.

Besides the tumbling equipment itself, use is made of a shaker for screening chips and sorting them for size. Storage bins for chips of different sizes are provided.

BOOKS . . .

DIE ZUENDUNG (Ignition). Third Edition, by *Erich Klaiber*, published by *Technischer Verlag, Herbert Cram, Berlin W-55, Germany*. This Part I of Vol. I of a three-volume work on electrical equipment of motor vehicles, the editor and the authors of the different volumes being engineers of the Robert Bosch Co. of Stuttgart. The volume on Ignition, here under review, deals with the subject from a technical rather than a popular standpoint, and is intended to appeal to engine designers, servicemen, and designers of ignition equipment.

THEORY OF PERFECTLY PLASTIC SOLIDS, by *Prager and Hodge, Wiley Applied Mathematics Series*. According to the authors, the mathematical theory of plasticity aims at providing more realistic methods of determining the safety factors of structures and machine parts; also to satisfy the demand for better control of forming processes such as rolling, drawing, and extruding. This text, said to be first in English on an intermediate level, is intended as an introduction to the branch of the general theory known as the theory of perfectly plastic solids.



FLEXLOC

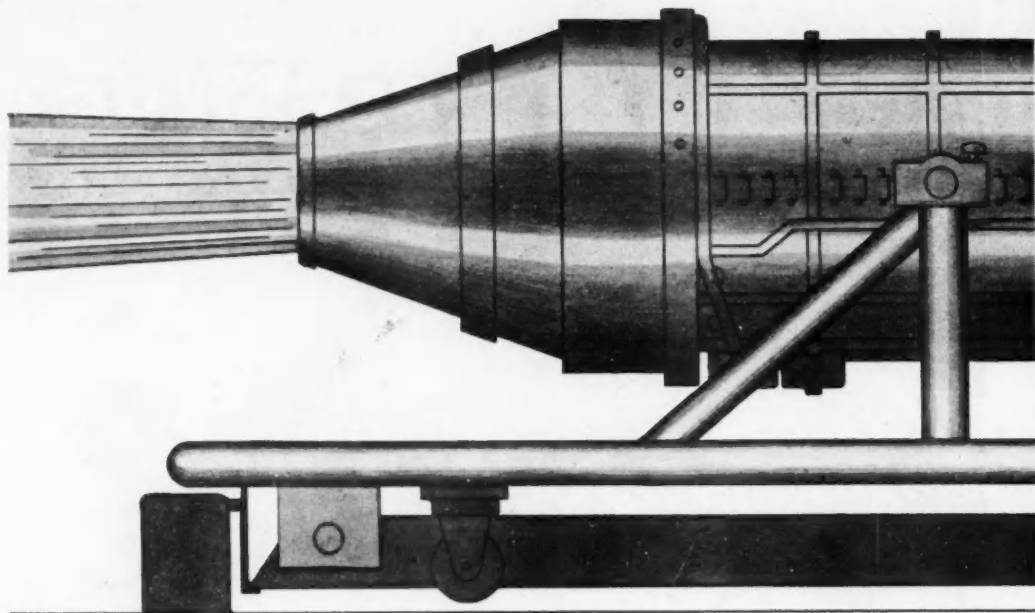
SELF-LOCKING NUTS

WE PRACTICE WHAT WE PREACH

Because we believe in our own gospel for eliminating vibration-loosened fasteners, we use FLEXLOCs to provide positive locking on the caster assemblies of our Hollowell Platform Trucks.

Perhaps you have a vibration problem. If so, send for samples and literature

SPS



New Applications of the
SR-4® LOAD CELL
 Bring Higher Precision in
JET THRUST
 with the
**BALDWIN
 THRUST STAND**

The thousands of pounds of thrust needed to project a jet plane through sonic barriers can now be measured with highest accuracy and exact reproducibility on the new Baldwin Jet Engine Test Stands at Wright Aeronautical Corporation.

Basic design was worked out in close cooperation

with Wright Aeronautical Corporation to eliminate hazards and inaccuracies.

No pit or ramp is required. This makes it unnecessary to install costly air and water scavenging systems to remove combustible vapors. It also eliminates the use of lift trucks in the test cell.

The engine is easily moved and positioned. The engine dolly is wheeled over the thrust stand. Base structure guides it into position.

The mounting imposes no questionable restraint on the weighing system. Air-actuated tapered retractable pins engage with tapered bores, lifting dolly wheels from the floor, and firmly integrating dolly and thrust table.

Safety interlocks prevent accidents. Fuel cannot be supplied until retractable pins are fully engaged.

Maximum accessibility is preserved. Access is limited only by the dolly structure itself.

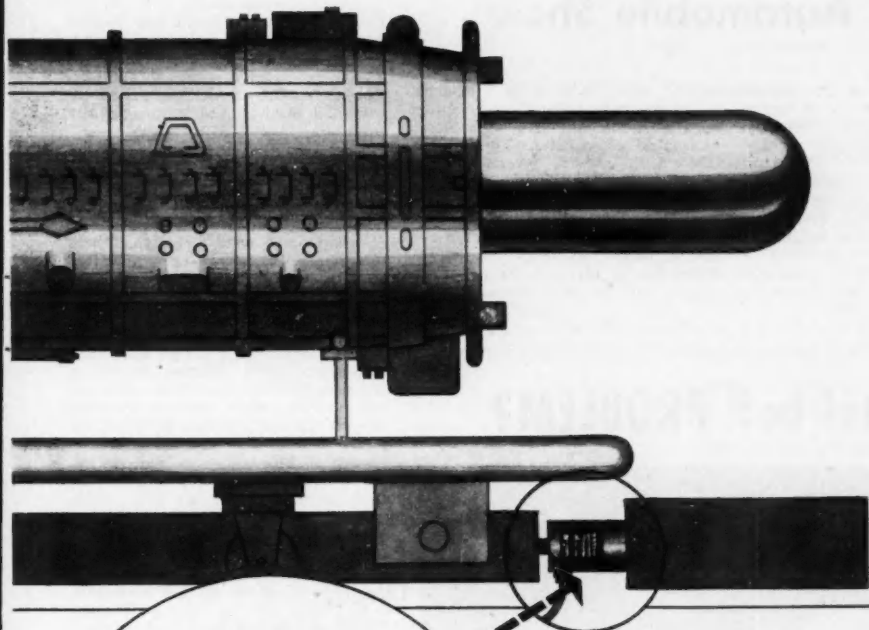
Top precision in measurement is attained. The Baldwin SR-4® Load Cell accurately transmits forces to the remote indicating instrument. Frictional and other unmeasurable losses are greatly reduced. The restraint exercised by the four stay-plates can be calibrated out of the indicating instrument.



TESTING
BALDWIN-LIMA

Eddystone Division, Baldwin-Lima-Hamilton Corp., Philadelphia 42, Pa.

AUTOMOTIVE INDUSTRIES, November 1, 1951



BALDWIN SR-4® LOAD CELL

The Heart of the Weighing System

The Baldwin Type "U-1" SR-4® Load Cell is a sensitive, accurate device that translates changes in weight into proportional changes in electrical energy. Ruggedly constructed, hermetically sealed, and with no moving parts, it employs the well-known SR-4® strain gage as a pickup. The gage is mounted on a rectangular steel column. Deformation of this column under load is accurately calibrated.



External circuits are entirely electrical. Recording, indicating or monitoring instruments and controls can be located at any remote point. This is but one of dozens of current applications for this load cell... and its possibilities have not yet been explored.



Baldwin currently offers the most complete line of testing equipment available. This line is constantly expanded to meet new needs. In addition, Baldwin is always ready to work with you in developing special equipment to solve special problems. Your inquiries are welcome.

HEADQUARTERS
-HAMILTON

In Canada: Peacock Bros. Ltd., Montreal, Quebec

AUTOMOTIVE INDUSTRIES, November 1, 1951

Paris Automobile Show

(Continued from page 36)

used by Mercedes. This firm showed for the first time in France the new six cyl models 300 and 220, AUTOMOTIVE INDUSTRIES, May 15, both with a chain-driven overhead camshaft. A feature of the independently sprung rear wheels by coil springs is the addition of a torsion bar, mounted outside the side rail and coming into action under full load, by electrical operation.

Opel (General Motors) represented Germany's largest production car, to-

gether with Volkswagen. Economic conditions have naturally turned German attention to small, light-weight economical automobiles. These include the D.K.W. car with a vertical water-cooled two-stroke engine and front wheel drive; Goliath, also utilizing a two-cyl two-stroke engine with front wheel drive; the Lloyd car with a two-cyl aircooled two-stroke engine (the Lloyd has a plywood fabric covered body); and Borgward-Hansa, with a

water-cooled four-stroke 91½ in. engine. Whereas at Berlin and Frankfurt several of the German engines had direct fuel injection, all those at Paris were fitted with carburetors. The explanation was that previously exhibited German models were merely prototypes.

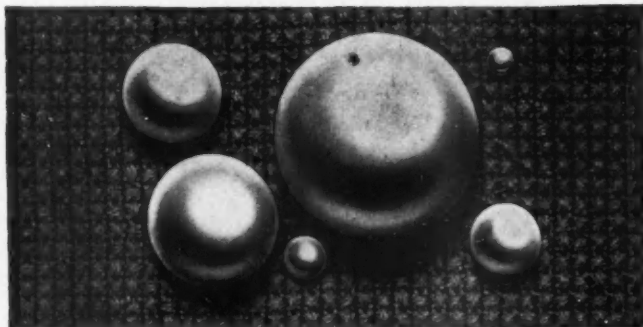
Although the 19 British makers showed a greater variety of types than any other country, they presented little that was really new. Austin is holding back an entirely new model for the London show, and if the others showed changes they were more or less of a detail nature, generally affecting styling.

Generally speaking, all the factories have been rebuilt and re-equipped and the problem now is to get maximum output. Citroen, although having a 15-year old design, has refused to make any change, while demand remains strong. Renault, having produced up to 750 vehicles per day, and unable to expand at Billancourt, on the edge of Paris, has broken ground at Flins, 25 miles to the west of the city. With the facilities available, Renault expects to attain a production rate of 1000 per day by the end of 1952. A year ago bulldozers started levelling the 500 acres of ground and making it flood proof, and a few weeks ago 538,000 sq ft had been covered and Clearing and Spiertz presses were in operation. The intention is to use Flins for all presswork, body trimming, painting and assembly, and to use Billancourt for foundry work, forgings, and machining operations. Transfer machines for the rear engine job, now being produced at the rate of 400 to 425 per day, will be left at Billancourt. The transfer machines for the new Fregate model are installed at Flins. The two manufacturing centers are united by road, rail and water.

Simca has spent \$30,000,000 on new installations at Nanterre for the production of the new Aronde model. The immediate program is 300 per day. Peugeot has now completed the reconstruction and re-installation of its factories in the east of France. Ford is working on the basis of 100 per day at the Poissy factory, the program being the V-8 Vedette model, with the new Comet as an auxiliary. Ford receives all Vedette bodies from the Chausson Co., while those for the Comet are built by Facel-Metallon. One assembly line handles all models. Outside of these four, French passenger car production is low. Panhard coming in fifth position with a rate of 50 per day on the Dyna model. Lack of manufacturing facilities make it difficult to extend this output. The Hotchkiss-Gregoire all light-alloy front wheel drive car is being produced at the rate of three per day, with an extension to five by the end of the year.

There were comparatively few technical developments in the truck and coach section of the Salon. Underfloor and rear engine mountings showed a

a metal ball PROBLEM?



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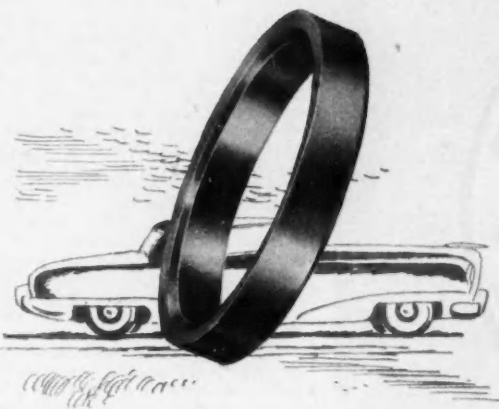


Whether it is a precision ball bearing or one of the other many ball applications in industry, your problem will not be entirely new. Strom has been in on many ball problems and knows the importance of the right ball for the job.

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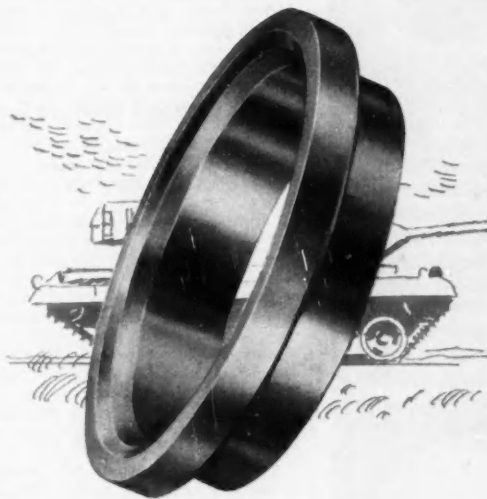


THE MASS PRODUCED motor vehicles of today require engine parts that assure maximum performance and dependability.

For fifty years Thompson Products has been making precision parts for cars, buses, trucks, tractors and industrial engines, both gasoline and diesel.

From cap screws in 1901, Thompson engineers have perfected such vital engine parts as valve seat inserts, whether for a Walker Bulldog Tank that is a vital link in our national defense, or one for the mass produced automobiles that are so essential to our way of living.

For engine performance you can take for granted: *count on* Thompson



Along with valve seat inserts, Thompson's Special Products Division manufactures piston pins and cylinder sleeves—for the finest aircraft engines, heavy duty trucks and tractors, industrial engines as well as for passenger cars.

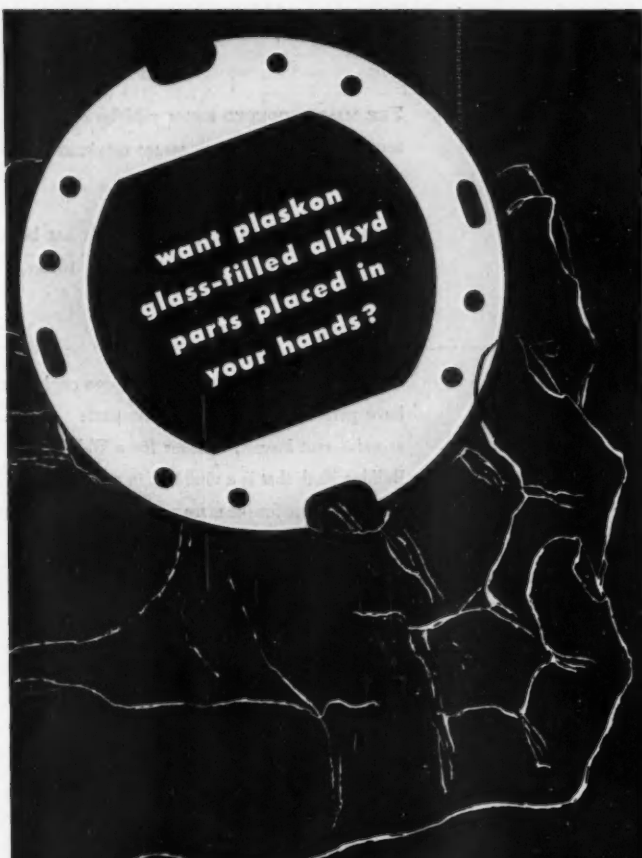
If you are having trouble with engine parts—if you need a better, more dependable supplier, just write or call Special Products Division, Thompson Products, Inc., 2196 Clarkwood, Cleveland 3, Ohio. You'll soon learn what car and plane makers have known for 50 years—you can count on Thompson.

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parts placed in
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As one of the first in the industry to use Plaskon Alkyd, we have the experience, as well as the design and tooling skill, to make the many advantages of this wonder molding compound available to you now. Yes, and now—through the use of a glass-filled Plaskon Alkyd—we can give you parts, such as this electric motor rocker ring, of exceptionally high impact strength. Just write us, or phone, if you wish to discuss the benefits of Plaskon Alkyd parts for your product. Or, if you prefer, our plane and pilot will bring you here for a time-saving conference. No obligation, of course.

When you look for plastic
mouldings, look first to
Plastic Research Products,
Urbana, O.



slight gain. Isobloc showed a single-deck bus being supplied for Buenos Aires. This uses a Hercules 140 hp horizontal Diesel engine, built by Hispano-Suiza, the Ferodo fluid flywheel, a Wilson four-speed transmission and an Eaton two-speed rear axle. The entire unit is ball and socket mounted on rubber cushions at three points. Since the engine is at the rear, the drive is taken forward to the rear axle. Isobloc construction is integral and is built up of steel profiled members to which sheet panels are attached.

Million Guet Tubauto has a construction of the same general class, with square section steel tubes forming the framework and screwed on sheet panels. This coach has a transversely mounted Panhard engine at the rear. Saurer follows the same general design with a six-cyl Diesel engine transversely mounted at the rear.

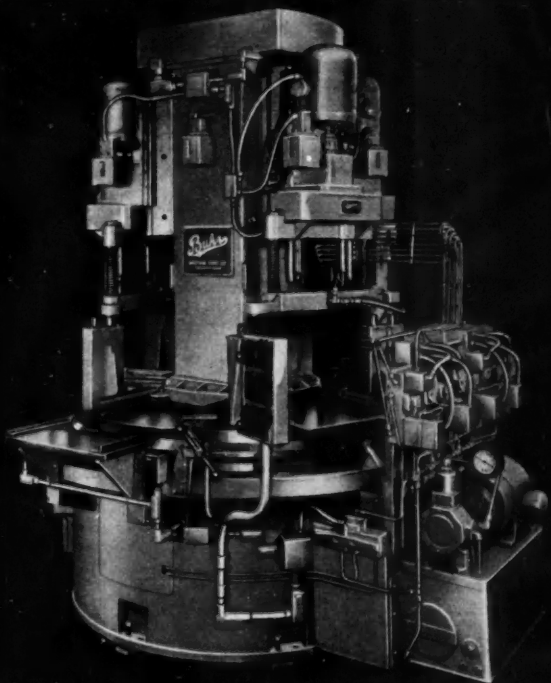
Renault introduced the horizontal centrally-located six-cyl Diesel coach of integral construction last year, with 45 seats, and has now extended this to a 37 passenger model for mountain service. Renault's chassis-body construction is steel tubes, mostly square section, with welded on steel panels. Two truck models are now produced with underfloor engine mounting. A new model is a 1650 lb four-wheel drive truck, with engine in front, four-speed transmission centrally located in the chassis and two open drive shafts, one to the front and the other to the rear axle.

Unic presented a new colonial truck with a 6½ ton load capacity, having a 100 hp gasoline engine. This is contrary to usual practice which is to use a Diesel for loads of this size. Features are a condenser on the radiator, elaborate protection against dust, and an oil radiator. The transmission provides four speeds, with an optional reduction gear, giving eight ratios.

The latest type of Paris bus was shown by Somua with a Panhard six-cyl Diesel engine having Lanova head and developing 150 hp, a Vulcan-Sinclair fluid flywheel, a separate four-speed Wilson gearbox and final drive by a Renault-type double reduction rear axle (spiral bevel with spur pinions at the extremities of the differential shafts). The Paris bus authorities have decided on the use of the Diesels engine for their entire fleet, and have adopted the Wilson pre-selective planetary transmission, now built in France by Pont à Mousson.

A four-ton front-wheel drive vehicle by Labourier featured a Diesel engine, a short open drive shaft to the four-speed transmission, and in this housing a heavy chain transmitting the power to a layshaft, from the front end of which the drive was carried forward by means of an open propeller shaft to the offset differential housing on the front axle. Immediately behind the transmission the frame took a deep drop, giving a very low flat platform, making it suit-

THANKED FROM TOKIO TO TEMPLEHOF!



Aircraft Pilots . . . from Tokio Airport in Japan to Templehof Airdrome in Berlin . . . are grateful for such Production Stalwarts as this Buhr 5-Station Hydraulic-Feed Center-Column Special Machine . . . which is now working the clock around . . . helping to turn out Cylinder Heads for one

of the world's largest manufacturers of aircraft engines—engines on whose reliability pilots consistently stake their lives! Is it any wonder that some of these pilots . . . who know the fundamentals of production . . . say "thanks" to such Special Machinery as this . . . for a job well done?

Aviation Industries Rely on Machinery Like This for Critical Production Work

For making such a critical product as a large aircraft engine, Uncle Sam chose one of the world's best-known engine manufacturers. Volume Production . . . of the highest quality . . . had to be set up as quickly as possible.

One of Their Problems



To drill and ream the holes in the Cylinder Heads of this particular aircraft engine—that was one of their problems.

To handle this important phase of their production, they called in Buhr.

What the Machine Does

In general—this Five-Station Hydraulic-Feed Center-Column Machine with 72" Automatic Index Table . . . drills

and reams (6) holes in Rocker Arm Pockets in Cylinder Head of Aircraft Engine . . . handling four parts at a time. Specifically, the Machine accomplishes this—

Station 1—Load and unload
Station 2—Drills (2) 1" dia. holes
Station 3—Drills (2) $\frac{3}{8}$ " dia. holes
Station 4—Drills (2) more 1" dia. holes
Station 5—Reams (2) .750" dia. holes
PRODUCTION—50 parts per hour at 100% efficiency.

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In the Aviation Industry . . . as in many others . . . Buhr has served leading manufacturers for many years—some for more than a quarter-century! They have come to rely on Buhr whenever they need machinery for critical high-volume production. They know that Buhr has excellent manufacturing facilities . . . that their sales, engineering and production staffs are trustworthy and experienced, specialized in

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able for loading horses, cattle and farm produce.

Deutz displayed two models of air-cooled Diesels, one being a straight six and the other a V-8 of 650 cu in. Cooling was by shrouding the cylinders and delivering a strong air blast from a positively-driven shrouded fan. An oil radiator, mounted by the side of the fan received a direct current from this latter. The Deutz six-cyl powered the trucks presented by Faun-Werke, of Nuremberg.

Growing use is being made, particularly on French coach chassis, of an electric brake mounted on the drive

shaft. This is used for slowing down the vehicle and can be kept in operation for long periods on mountain roads, the ordinary friction type brakes being used for a complete stop. On several of

the heavy trucks and large coaches there was an internal friction brake on each wheel, an external brake on the differential, and in addition the electric brake.

Dual-Purpose Plants

(Continued from page 39)

PRECISION PARTS

As long time manufacturers of jig bushings and components for diesel engine parts, cam rollers, etc., we are equipped to produce a wide variety of similarly related precision parts • Our facilities include automatic blanking, heat treating, centerless and cylindrical internal and external grinding, a variety of honing and lapping machinery — and the most modern types of precision inspection equipment • Our Engineers are well versed in the processing of correct steels for specific applications — making due allowance for shock resistance and wear and abrasion — as well as for cost.



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are unknown. There is an added reason, therefore, why we must utilize the resources of the nation as efficiently as possible. We must have the maximum flexibility in our economy and industry so that we can devote a changing proportion of the nation's effort to peace, preparation for war, or even all-out war, as conditions may dictate. This requires a new kind of cooperation between industry and government, especially on the part of those established manufacturers who must assume the responsibility for prime contracts for the larger or highly technical military items that are now necessary to victory in war. These manufacturers are the ones who have contributed so much to our high standard of living and who have great responsibilities in our peacetime activities. They have large work forces and established peacetime businesses that may have to be curtailed in varying degree to make way for defense or war production.

Some 12 years ago when we realized the possibility of becoming involved in a rapidly spreading war we were forced to feverishly construct new facilities for defense production and plan the conversion of our peacetime facilities to what would be required in all-out war. Now, only six years after the shooting stopped in World War II, we again face the necessity of preparing our country to defend itself, but find the special facilities constructed at great expense in the World War II period largely liquidated or converted to peacetime production. The country cannot afford to repeat this mistake. We must profit by our experience in World War II and what has happened since.

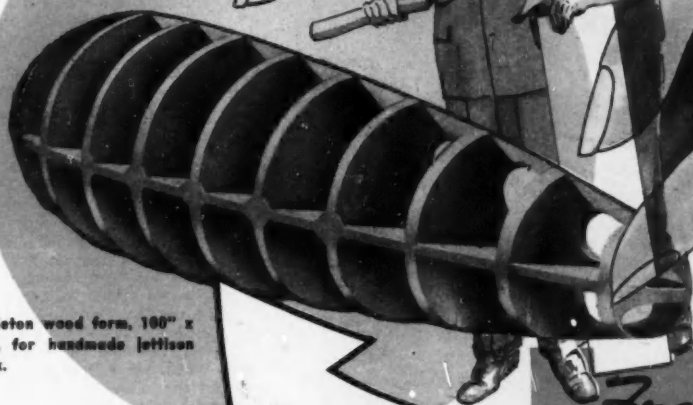
If we must have an adequate and flexible mobilization plan for an indefinite period, we must develop ways and means for integrating capacity for the production of military material with the production facilities required for the manufacture of consumer and producer goods normal to a peacetime economy. We cannot afford either the time or money incidental to the acquisition of facilities for the production of military material each time a war or threat of war disturbs us.

I am proposing that manufacturers who are expected to assume responsibility for the production of the larger and highly technical military items be prepared to operate dual-purpose plants which can be used in three ways—For combined production, for

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Paris, France

total war production, or for total civilian production. New plants now being constructed as part of the defense and essential civilian program should be constructed with this objective, and existing facilities, as they are partly changed to defense production, should be organized so that they are flexible for these same three purposes. Definite agreements and understandings should be worked out by the Government, through its defense agencies, with these manufacturers for preserving the possibility of this type of dual operation for at least 10 years and for renewing such agreements for several generations if necessary.

It would appear to be time for this country to: (1) Decide that we need a permanent national defense program; (2) Recognize that manufacturing industry is one of the major elements of such a program and must be kept prepared at all times to produce military equipment to the latest specifications and designs and, on short notice, in adequate quantities to meet full war requirements; (3) Provide legislation such as may be required to permit longtime contracts between the defense departments and industrial concerns for the custody and maintenance of such special or excess manufacturing facilities as may be required for war production and which also will permit to the extent possible utilization of dual-purpose plants and facilities at all times in the interest of maximum production and stable employment.

These points are not entirely new and serious efforts have been made to accomplish in part some of these same objectives, particularly in the last few years. We now have a unified National Defense Establishment, a National Security Resources Board, the War Munitions Board and many other boards. Many patriotic citizens have accepted appointments in our defense establishment. Much progress has been made, but the most fundamental and probably the most important element of a sound national defense program has not yet been provided for.

The most important element in an adequate industrial defense plan must provide for the immediate employment of industrial labor with experienced supervision and management in its normal location and in a type of military production most closely associated with peacetime production. This can be done only through the medium of dual-purpose plants. Since a good defense plan should also provide for maintaining commercial production at the maximum level possible at all times, we must be able to produce our normal defense requirements with a minimum of dislocation of commercial production, and we must be able to expand defense production to a considerable degree without totally eliminating commercial production. Even in the case of total war all consumer production cannot be stopped completely nor

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any of it for an indefinite period of time.

The difference in time required to meet an emergency with dual-purpose plants might well be more important than the final possible saving in cost or even the avoidance of dislocation of employment. It is essential that we also recognize that the time it takes to go to war is no longer the time it takes to train a soldier, but rather the time it takes to produce his equipment and arms. Furthermore, we all know that stockpiling of equipment and arms is a doubtful defense measure because of the never-ceasing technical development of military equipment. Such

technical developments would gradually affect production facilities but probably to no greater degree than commercial production facilities are being affected by technological progress, and it is important that improved manufacturing techniques be applied to production for peace or war. If America has to fight we want the newest and most effective weapons for our fighting men.

Drawings are shown here how a plant can be used for the production of jet engines and of automobile body stampings and what portions of the plant would have to be special for each purpose. Also, a drawing showing how a

plant could be used to assemble airplanes and automobiles and the portions of the plant that would have to be special for each purpose. The drawings also clearly indicate the large percentage of the plant area that could be used for either or both purposes. Offices, cafeterias, locker rooms, hospitals, power plants, tool rooms, maintenance departments, railroad sidings, parking lots can easily be identified as useful and necessary for both purposes. Certain parts of a dual-purpose plant such as the space and equipment for testing jet engines can be used only when jet engines can be used produced. Likewise, the space, foundations and heavy presses used for making large stampings could be used only for automobile production and would not be required in the manufacture of jet engines. But a large proportion of the manufacturing space could readily be made available for either purpose, and the necessary light equipment and assembly fixtures for either or both types of production could be quickly moved in and out of such areas. Likewise, management employees, skilled employees and production workers would be immediately available and could readily be transferred from one type of work to another.

If such a dual-purpose plant were being used for all-out war production, the equipment special for the peacetime products could be stored in the area that had been laid out especially for the kind of machines and processing equipment that could not practically or possibly be converted to war production. Likewise, if the plant were used entirely for civilian production, the special equipment for jet engine or aircraft production could be stored in the hangars or in parts of the plants that were special for war production. Such plants could also be used for simultaneous production of both military and civilian items. The job opportunities of the employees working in such plants would be reasonably protected. There would be no plants standing idle without competent custodians at times when they were not being used for war production. The ability to convert quickly to war production would be preserved. Of great importance, also, the properties could be quickly and flexibly converted back and forth from one purpose to the other without great expense.

During periods of limited defense production and as a part of the arrangement, the manufacturer who had such a dual-purpose plant would have the obligation of maintaining pilot lines if requested and of keeping up to date on engineering and processing of the military products he was scheduled to produce if a large military program again becomes necessary.

If instead of such dual-purpose plants, separate plants are planned—those producing war materials exclusively and those producing civilian products exclusively—there is bound to be dislocation of hundreds of thousands of workers as shifts are made from one

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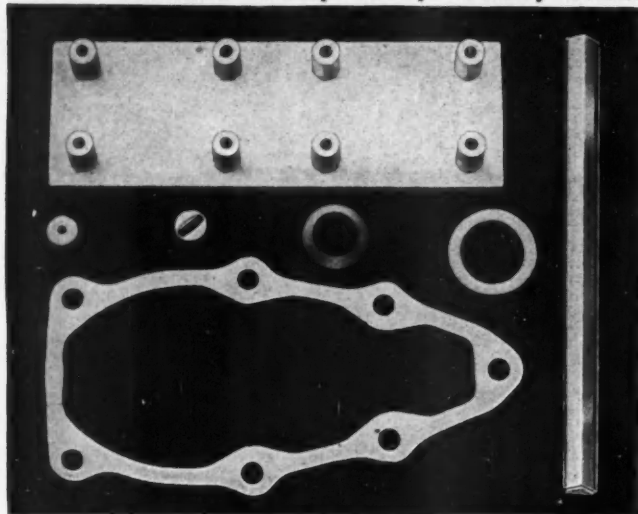
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type of production to the other. Dual-purpose plants, while giving the nation the security that would result from the ability to quickly convert from peace to war production, will at the same time put the emphasis on peace, not war. They will avoid the expense and waste of building and maintaining large plants planned only for war production. They will avoid creating and maintaining organizations and businesses whose interests and profits would depend only on war production, and of creating jobs for hundreds of thousands of employees whose job security would depend on war or the preparation for war. Such a plan for dual-purpose plants is consistent with our American objective of promoting world peace through strength and preparedness.

These dual-purpose plants should be operated and be a part of established industry. Our established industry is a remarkably efficient system for producing goods, and our high standard of living attests to its effectiveness. This system is essentially an interdependent network of manufacturing concerns of all sizes—large, medium and small. As a matter of fact, if it were not for our marvelous American industrial system, including the larger companies with their hundreds of thousands of employees and their mass production accomplishments, we would not be confronted with this defense problem. Stalin or some other dictator already would be here.

PUBLICATIONS

(Continued from page 58)

D-145 Remote Controls

Sperry Products, Inc.—The new line of Sperry hydraulic remote controls is described generally in bulletin 20-106 just released.

D-146 Heat Treating

Carpenter Steel Co.—Prepared is a new, compact heat treating slide chart.

D-147 Drilling Machines

Taylor Dynamometer and Machine Co.—Announced is a bulletin, No. 181, covering the Hi-Eff line of sensitive precision drilling machines.

D-148 Machine Tools

South Bend Lathe Works—Two new catalogs, only $2\frac{1}{2}$ in. by $1\frac{1}{2}$ in., illustrate and describe practically the entire line of precision lathes, drill presses, shapers, attachments and accessories.

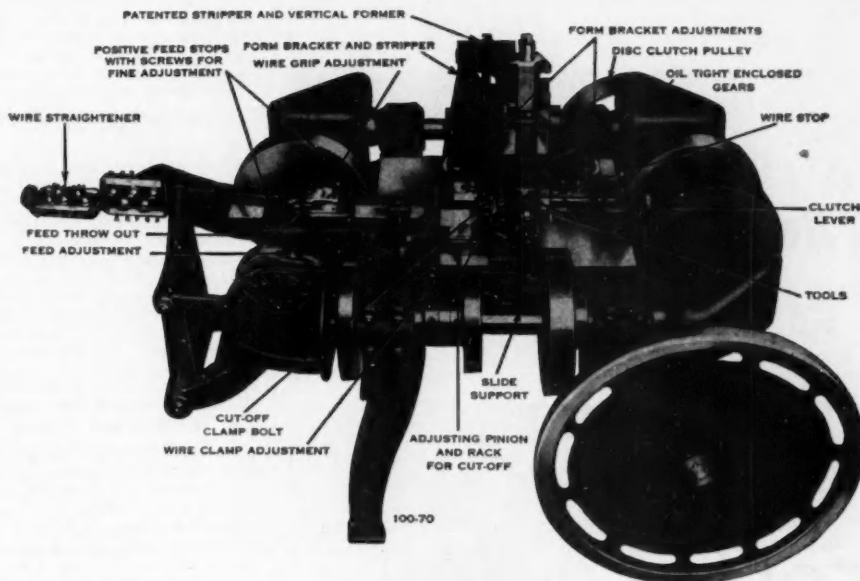
D-149 Industrial Trucks

Baker Industrial Truck Div., Baker-Raulang Co.—Bulletin 1350-1 describes and illustrates the new Baker four-purpose carriage.

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WIRE FORMS and COILED STRIP WORK "unlimited" with BAIRD FOUR SLIDE Automatics

The FOUR SLIDE is actually a basic design of machine, not a jack-of-all-trades, but one which we stock and tool to your specific requirements for high speed repetitive production. There are 8 standard sizes that cover wire diameters from 1/32" to 1/2" and ribbon widths from 3/16" to 1-3/8" . . . larger capacities on special order.

Machines may be supplied with crowned pulley for V belt drive from countershaft, or with standard or variable speed motor drive mounted directly on the machine . . . V belt

from motor sheave to machine pulley. Operation is smooth and quiet.

Tooling possibilities are extensive and can still be increased by the ingenuity of the toolmaker.

Standard attachments are Form Raising, Pin Pulling, Ring Setting and Horizontal Presses. Special attachments will be designed and built to suit specific jobs.

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MACHINES • AUTOMATIC PRESSING • TURNING BARRELS

95A51

Machining Titanium Alloys

(Continued from page 47)

bars are milled square to length at about 50 fpm (2 1/4 in. cutter diam, 92 rpm) with a 1/8-in. depth of cut and one ipm table feed. Tool life is about 120 pieces between grinds (about 25 cu in. metal removal).

Cut-off operations

Reports on sawing titanium vary from "difficult" to "almost impossible." Band sawing seems to be out; the

Motch and Merryweather saw seems to work with fair success; and certain types of hacksaws give promise. Abrasive sawing is the best bet at the moment, however, provided, proper equipment is used.

In abrasive sawing titanium, it is impossible to plunge straight through a large piece. The wheel must cut successive overlapping shallow scallops, keeping the area of wheel contact as

small as possible at all times and giving the coolant the maximum access. If possible, the work should be slowly rotated or indexed so the wheel can cut toward the center and never have to cut more than halfway through. Machines having a wheelhead capable of oscillating as well as plunging motion are ideal. Titanium's poor heat conductivity requires the maximum flow of coolant if heat cracking is to be avoided. The tendency to clog wheels also accentuates the importance of minimizing the wheel-work contact area.

A soluble-oil type coolant is available that kills the objectionable rubber-wheel odor. Seven-in. diam titanium bars have been cut, rotating the work and oscillating the wheel, in 10 min (about 14.2 seconds per sq in.). A one-in. bar is cut in four seconds.

Considerable promise is shown in the abrasive cutting of titanium at lower wheel speeds. Wheel speeds of 3000 to 4000 fpm (instead of the usual 5000 to 6000) have been tried with good results; at these speeds wheel wear is reduced appreciably.

With hacksawing, constructive recommendations indicate an extremely coarse saw (two to four teeth per inch), slow speeds and heavy feeds. Ordinary fine-toothed saws and conventional feeds result in extremely small feeds-per-tooth. With titanium, this results in rapid work hardening which makes further cutting extremely difficult.

Drilling and tapping

All machining operations on titanium alloys require the observance of this rule: Because of the rapid and extreme work-hardening tendency, do not disengage feed while tool is in moving contact with work. This is particularly true in drilling. For the same reason, pilot holes are "out" and the enlarging of holes is to be avoided. Poor thermal conductivity and a strong "pick-up" or "welding" tendency are two more properties of titanium which require special techniques, and the tough, non-curling type of chip further complicates the picture in drilling and tapping because of the space restrictions.

Eccentric drilling, using high-cobalt drills with notched lips, and slow speeds and about double the feed common with steels offers promise of giving improved results. (Next smaller size drill, point ground off center, runs out, drilling a larger hole.) This minimizes rubbing and reduces pickup and heating.

The notched lip idea in drilling when carried over to tapping results in use of staggered-tooth taps, which also tend to break up chips. Use of a 60 percent thread and a tapping speed of 12-15 fpm are also recommended.

This article is extracted from one chapter of a book—USAF Machinability Report, Volume 2, 1951—which was recently published by Curtiss-Wright Corp., Wood-Ridge, N. J.

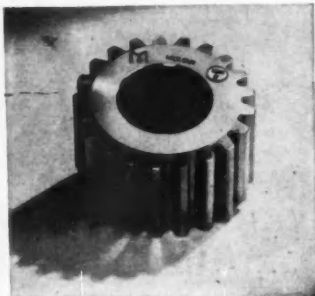
We're
Up
To
Our
Ears

...and we
like it
—and we
know what
caused it...



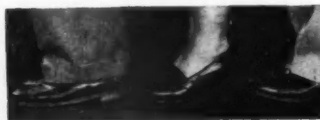
At IGW, your precision gear problem is engineered and scheduled efficiently—then produced on modern equipment operated by skilled craftsmen—and controlled by rigid inspection.

Result...
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Bodine CASE HISTORY NO. 31

PROCESSING A STAINLESS STEEL ELECTRIC VALVE BODY

1.



Hand load blank to fixture and hand clamp.



2.



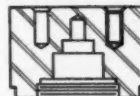
No. 21 (.159) comb. drill and c'sink, vert. spin.

3.



.452 comb. drill and c'sink, horiz. spin.

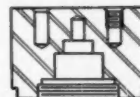
4.



No. 21 comb. drill and c'sink, horiz. spin.

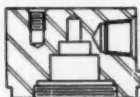


5.



10-32 tap, vertical spindle.

6.



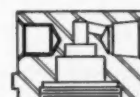
10-32 tap, vert. spin., taper ream for 1/4" pipe tap, horiz. spin.

7.



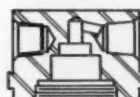
1/4" dia. drill, horizontal spindle

8.



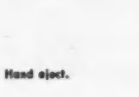
Combination drill and c'sink, horiz. spin.

9.



Taper ream for 1/4" pipe tap, horiz. spin.

10.

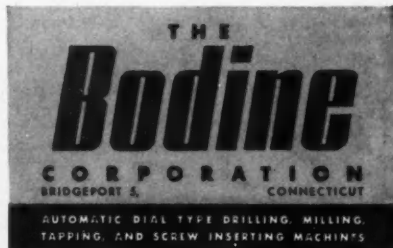


Hand eject.

PRODUCTION:

Machine wired for either continuous automatic operation at the rate of six strokes per minute, or for individual cycle operation. Production under automatic operation is 6 completed valve bodies per min. or 300 parts per 50 min. hour.

ACCURACY: Taper reamed holes held to $\pm .002$ from bottom face and opposed $180^\circ \pm 30'$. 10-32 tap holes held to $\pm .0015$ on location.

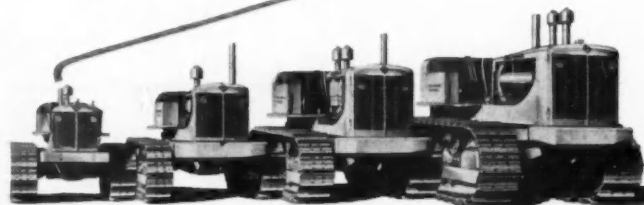


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Are Standard on Allis-Chalmers New Tractor Line

From the versatile 11,250-lb. HD-5 to the towering 41,000-lb. HD-20, all four models in the new Allis-Chalmers tractor line are protected by United Oil Bath Air Cleaners. These powerful track-type tractors, each a standout in its size class, are assured of the most thorough air cleaner protection possible—a time-proven protection which efficient United cleaners are furnishing daily for millions of internal combustion engines in every conceivable type of operation.

Here are the dual cleaners with pre-cleaners designed for the new Allis-Chalmers HD-20.



HD-5	HD-9	HD-15	HD-20
40.26 drawbar hp, 11,250 lb.	72 drawbar hp, 18,800 lb.	109 drawbar hp, 27,850 lb.	Hydraulic Torque Converter Drive — 175 net engine hp, 41,000 lb.

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UNITED AIR CLEANER DIVISION • CHICAGO 28
MITCHELL DIVISION • PHILADELPHIA 36
BIRMINGHAM 11, ALABAMA

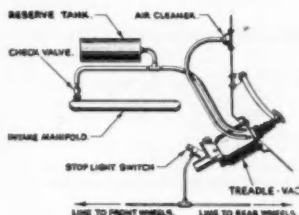
★ AIR CLEANERS ★ METAL STAMPINGS ★ DOVETAILS
★ IGNITION AND TURN SIGNAL SWITCHES ★ ROLLED SHAPES

'52 Packard

(Continued from page 41)

down operation. Incidentally another improvement in clutch design is that the hub floats on the spline, making the plate self-centering in action.

Planetary design also has been improved by the adoption of a damper, illustrated here. It consists of three equally spaced wedges of sintered metal mounted between the cage and reverse gear and functioning somewhat like overrunning clutch elements. This was done to achieve positive smoothness in the drive line by eliminating back-lash in the mechanism.



Packard's power braking system called the *Easamatic*, consists of a power cylinder, a piston with built in control valve, and a hydraulic brake master cylinder. Mounted on the engine side of the toe-board, it utilizes a treadle mounted lever—similar to the accelerator—instead of the conventional brake pedal. Engine vacuum is used for operation.

The breather has been relocated to eliminate oil drag-out. Further work is under way to improve converter performance and increase torque multiplication by improving the form and finish of converter elements through advanced foundry techniques.

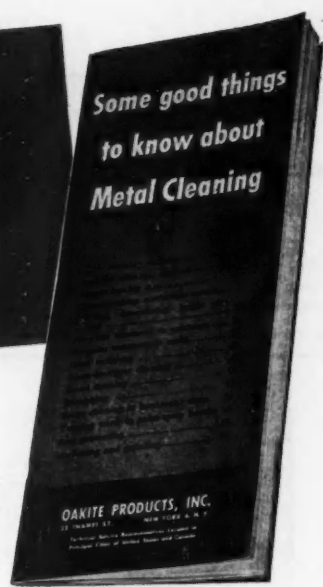
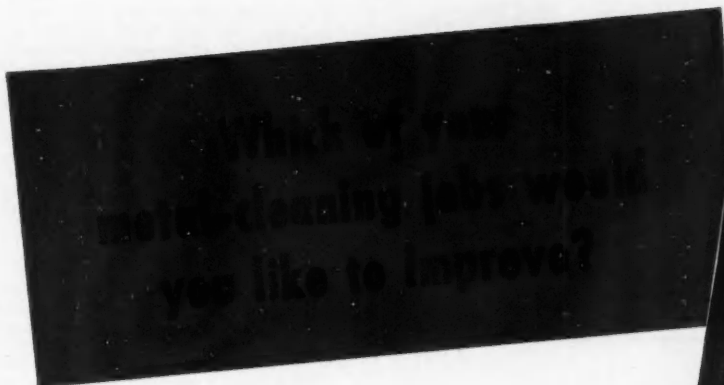
Other improvements include: refinements in the governor and governor drive; new neutral safety switch; adoption of a nylon speedometer gear which is molded directly to the shaft.

The Mayfair and convertible models will feature larger brakes and steering gear assembly, actually the same as on "400" models.

In the interest of copper conservation, Packard will install 20-in. cooling fans which provide ample cooling and yet permit use of thinner radiator cores. Radiator core mounting also has been improved.

Detail engine changes include: adoption of a new type timing chain; a vertical type air cleaner on all 327-cu in. engines; and a higher temperature engine thermostat. The new air cleaner requires a change in carburetor calibration. A 45-amp. generator also has been adopted as standard equipment.

Another improvement is the use of a new clutch driven member and tail shaft mounting on cars specifying overdrive.



Are you cleaning metal in the most economical way? See page 9 of Oakite's new FREE booklet on Metal Cleaning.

Are you cleaning metal the fastest way? See page 11.

Can you clean brass anodically with no tarnish? See page 18.

Can you clean steel and condition it for painting for less than 20 cents per 1,000 square feet? See page 26.

Could you use a cleaner that removes rust and oil at the same time; often eliminating all need for pickling. See page 28.

Do you have trouble cleaning parts that are too large to be soaked in tanks or conveyed through washing machines? See page 30.

Does your burnishing barrel produce a luster you are proud of? See page 32.

What do you do when the overspray neither sinks nor floats in the wash water in your paint spray booth? See page 35.

Do you dry steel parts before anti-rusting? See page 37.

Listed below are some of the operations discussed in this 44-page handsomely illustrated booklet. Please check the jobs in which you are interested. Then let us show you how Oakite materials and methods can give you better production with greater economy.

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Observations

By Joseph Geschelin

Conversations with people familiar with current developments indicate that pistons of secondary aluminum alloy are indeed a practicality and can

be used to replace pistons of virgin aluminum without difficulty. In fact, we find that secondary alloy has been used successfully in production for some time.

Naturally, the secondary alloy must be closely controlled to be effective, and that is one of the major problems in the foundry. There is some question as to relative physical properties and some feeling that there is a weakness in the top ring land where severe pounding is always a problem. To meet this condition, some of the piston ring people recommend use of a steel insert. It adds to cost, of course, but may be instrumental in extending ring and piston life.

Continued research promises to effect some major improvements in passenger car piston rings. One prominent producer is doing considerable work with chromium-plated, heat-treated steel rings, using a special rolled wire of rectangular section which requires little machining. Another interesting development, not too far away, is that of making rings of powdered iron. When it becomes a production reality, powdered iron will be used first in making small rings such as those found in automatic transmissions. If that application proves successful it will be extended to piston rings for engines.

There is considerable apprehension among some parts makers concerning recent cutbacks in passenger car production due to restrictions on materials. While it is true that the productive capacity of passenger car producers has been greatly increased in recent years, it remains that a five-million unit year is still big business. The fact is that the industry, as a whole, has reached this goal only four times. Here is the record as you will find it in the AUTOMOTIVE INDUSTRIES Statistical Issue for 1951:

1929	5,358,420
1948	5,285,425
1949	6,253,602
1950	8,002,782

Despite the many vicissitudes during the past year, it is anticipated that 1951 production will exceed the five-million mark by several hundred thousand units.

Recent discussions in tractor circles indicate the need for exhaust valve rotation to extend the life of valves and engines, regardless of size. It will be recalled that Ferguson, Inc., adopted T-P valve rotators in its new engine, which was recently announced. AUTOMOTIVE INDUSTRIES, Sept. 15. It is of interest in this connection that most tractor manufacturers now are specifying valve rotators either as standard equipment or as a recommended service installation. In a brochure entitled "Valve Rotator Applications and Availability," the Ethyl Corp. lists all makes of tractors and indicates models on which valve rotators are either standard equipment or available as a kit.



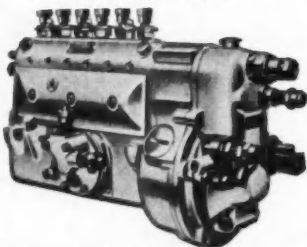
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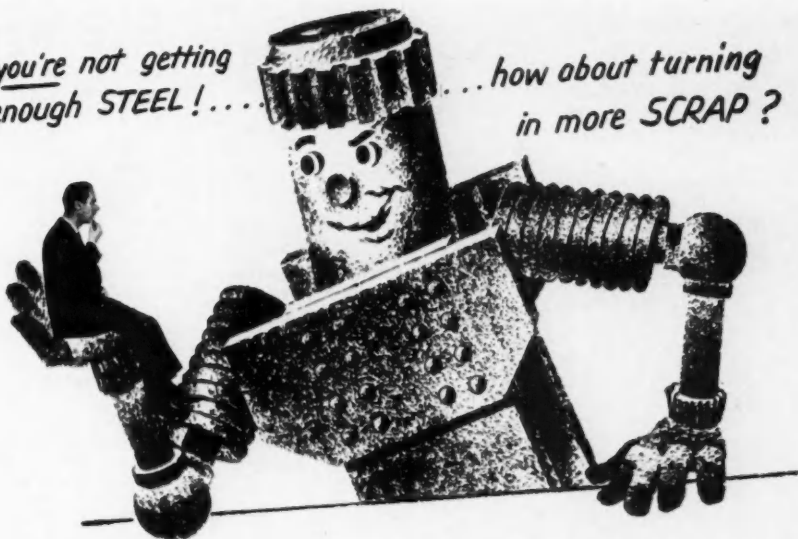
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you can possibly spare and rush it to your scrap dealer. Rip out any old rails and switches that are rusting away on unused sidings—and scrap them. Scrap your antiquated dies, jigs and fixtures, your worn-out tanks and boilers that are gathering dust in some forgotten corner. Make sure that not a single pound of scrap is by-passed. Sell it—ship it. It means good money for you, more scrap for the Nation's scrap pile, and more steel for *everyone*.

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AMERICAN-FORT PITT SPRINGS

SAE Meeting

(Continued from page 45)

and execute an attack; but five years from now, he will be extremely fortunate to have 20 sec in order to maneuver and execute an attack.

An interesting problem in the slightly more distant future is aerodynamic heating. Sustained flight at Mach three will heat the aircraft surface to 300 F. This will require the development of new alloys and equipment. Heating might well be one of our next supersonic limitations.

Bomber Development

The advent of the jet engines following World War II opened new speed ranges for bombers. We have now developed, or have under development, jet bombers in all classes. Speed capabilities of these aircraft have placed them in a competitive position with the fighter aircraft. Ceilings have improved beyond that achievable with the older piston engine types.

Advantage of jet engine performance has also been taken on older types. The addition of jet pods on the B-36 has increased its load-carrying ability, and greatly increased both its target speed and altitude.

Although improving the speed and altitude, the jet engine has limited the range of combat bombers. We have overcome this deficiency by various means, but the chief method is refueling. The development of this capability has added great flexibility to the strategic force, as well as offering the solution to range problems.

Improved designs will eliminate the need for range extension devices in the future except for the need for flexibility of operation. Improved engines, reduced crew and equipment weight, plus improved aerodynamic characteristics, indicate that near-future bombers will reach near-sonic speeds at extreme altitudes.

Logistics Carrier

Heavy transport aircraft are now referred to as "Logistics Carriers" since these aircraft provide logistic support for all Air Force operations. Our development conceives that these carriers will have the capability to perform a variety of missions. Some of these will be to transport normal Air Force supplies on intercontinental flights; carry, launch, and retrieve parasite fighter aircraft; serve as refueling tankers; and transport large aircraft components external to the internal volume—fuselage sections, wings, etc. Development in this direction indicates aircraft in the 400,000-lb gross weight category are capable of carrying 100,000 lb payload with a range of approximately 3500 miles and (Turn to page 110, please)



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cruising at speeds nearly double that of present piston-engine type aircraft.

Other Aircraft Developments

The recent "Southern Pines" exercise has conclusively demonstrated the feasibility of our development effort in the field of assault transports to support airborne operations. Continued development effort in the assault transport area will be directed to increase short field performance in unprepared landing areas.

The ideal assault vehicle is one that combines the vertical take-off and landing characteristics of a helicopter with the high-speed cruising performance of conventional fixed-wing aircraft. Development effort in the convertiplane field may produce such an aircraft in the light plane class within the next few years. These small convertiplanes should prove the practicability of a combined helicopter-airplane. At that time, we will explore the development of a machine with a substantial payload of cargo or passengers which will approach the ideal assault aircraft for military service. The convertiplane development holds promise of considerable value in civil operations by virtue of reducing the requirements for expensive airport facilities.

Guided Missile Development

There are several problems which are causing us concern in the development of guided missiles. Of these, the high temperature materials problem is one of the most important. In missile structures, the Air Force has found that it can get into the supersonic region with aluminum, but as speed and adiabatic heating increase, the useful limit of aluminum and its alloys is soon reached. Steel will carry us much higher in supersonic speed and there seems to be a field for titanium between aluminum and steel.

Reliability is a problem that means making a missile operate over a period of hours completely unattended, including all the complex instrumentation and other gear. Our large commercial airliners are regarded as reasonably reliable by most people, yet it is necessary to have in these aircraft one man whose full-time duty is to attend the engines alone. This gives you a measure of the difficulty of the problem. But, let me point out another consideration—the human factor! We must build all of our equipment simple enough to be operated, repaired, and maintained by the average airman. Some rather extensive training programs are under study and underway at this moment, designed to produce in airmen the necessary qualifications.

Lastly, I would like to say a word about cost. Currently, costs for piloted aircraft and pilotless aircraft are fairly comparable. We have found, however, that much of the cost of a piloted aircraft is bound up in provisions for maintaining human life aboard, so that there is a good prospect that further

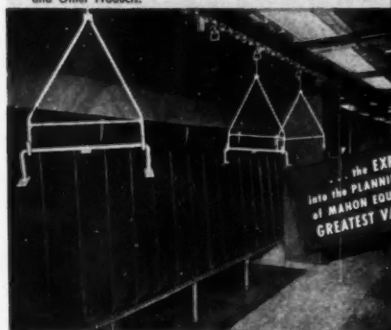
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Interior of Mahon Hydro-Filter Spray Booths at Revco, Incorporated. Note New "Hydraire" Flood Sheets which make for better working conditions.



Home Freezer Parts Emerging from Mahon Hydro-Filter Spray Booths at Revco, Incorporated, and Entering Finish Bake Oven Located Overhead.

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Home Freezer Parts at Revco, Inc., Emerging from Mahon Five Stage Cleaning and Rust Proofing Machine and Entering Dry-Off Oven Located Overhead.

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Major units of the Complete Mahon Finishing System at Revco, Inc., Deerfield, Mich., are illustrated here. The System provides for continuous processing through Cleaning, Rust Proofing, Drying, Painting and Finish Baking—all on a single conveyor line . . . it reduces costs to a minimum, and, through better control of each phase of the finishing process, it produces a finer finish. It is another typical example of cooperation on the part of Mahon engineers in planning a system complete in every detail, yet so compact that it occupies a minimum of floor space. Some of the novel features of the system are the new Mahon "Fire-Jet" Heaters on processing solution tanks, and the new Mahon "Hydraire" Flood Sheets in the Spray Booths, which make for improved working conditions. When you are in need of finishing equipment you can't do better than to rely on the recommendations of Mahon engineers, because, Mahon engineers have pioneered development in this highly specialized field for over thirty years . . . they have accumulated a wealth of technical knowledge and practical know-how not available to you elsewhere. See Mahon's Insert in Sweet's Mechanical Industries File, or write for Catalog A-652.

THE R. C. MAHON COMPANY

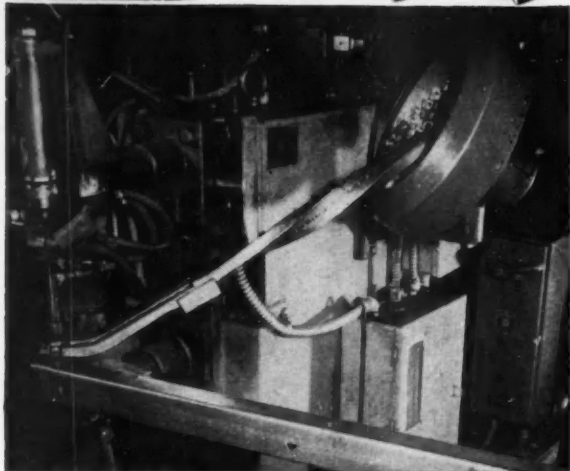
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In turn, the operation of attaching part to the channel member is speeded up through the convenience of Midland Welding Nuts.

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development and large scale production will see guided missiles considerably cheaper than aircraft as we know them today. This one factor of cost will undoubtedly determine the areas in which guided missiles are to be used in warfare.

Propulsion Development

Propulsion development today is the limiting factor in the capability of our aircraft with respect to high speed, high altitude, and long range. The nature of many current and projected airframes and power plants is such that there exists an additional requirement for auxiliary thrust for takeoff and combat performance. Our future power plants will incorporate many advanced ideas in keeping with these needs. To this end, there is an active program under way in the development of engines in the following four classifications: turbojet, turboprop, rocket, and ramjet.

Turbojet developments are being guided in the direction of higher thrust, lower fuel consumption, and drastically reduced utilization of metals in short supply. Component improvements include the study of supersonic compressors, more efficient combustion systems (especially at high altitude), the substitution of non-critical materials in the hot end of the engine, and the general increase in service life and reliability. Development of water injection and afterburning for auxiliary thrust is continuing.

Emphasis is being placed upon the long-range capability of turboprop power plants. Engines of increased horsepower are being developed incorporating compressors of higher compression ratio, high temperature turbines, and design features to reduce installed weight. We now foresee engines which will develop thrust in the 20,000-30,000-lb range. In conjunction with this, there is an active program in supersonic propellers.

Rocket developments are aimed at application to assisted takeoff of aircraft, to aircraft primary powerplants, and to guided missiles. Special attention is being given to the use of widely available fuels and oxidizers and to propellants of extremely high performance.

Ramjets are being developed for use in guided missiles that will fly at supersonic speeds greater than those at which we expect the turbojet will be effective.

As a result of several years of intensive study and research, we have established that nuclear-powered aircraft are technically feasible. A nuclear power plant is being developed for use in a flying test-bed that will have, for all practical purposes, an unlimited range. Only a moment's reflection will disclose the tremendous advantages that will accrue to the nation which first possesses aircraft of unlimited range and endurance, limited only by the tolerance of the crew.

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BULLDOG VACU-BREAK MASTER SAFETY SWITCH

Switch users hail Bulldog safety switch simplification program. Now, one great line of 38 Bulldog Vacu-Break Master Switches fills all safety switch requirements! Type A switches . . . at C prices . . . possible only by concentrating switch production on one sensible, simplified line. Just 38 switches . . . instead of hundreds . . . to save you time, money, effort whenever you order, use, stock Type A, C or D safety switches.

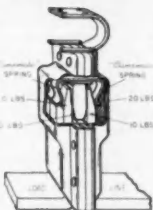


**A Type A Switch
at Type C prices!**

All the famous Bulldog features

EXCLUSIVE CLAMPMATIC CONTACTS!

"Clampmatic" is a method for obtaining extra and enduring contact pressure between switch jaws and blades. In ordinary switches, jaws exert about 10 lbs. pressure on blade. In Vacu-Break Switches, the Clampmatic spring augments this with 20 lbs. pressure on both "line" and "load" sides of jaws. Thus, Clampmatic provides a total of 30 lbs. of contact pressure between both sides of blade and jaw for "bolt-tight" contact.

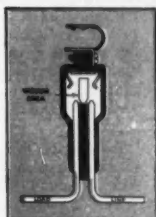


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Interlock: With interlock pin at Hole A, cover cannot be opened unless switch is OFF. Cover must be fully closed to throw switch ON.

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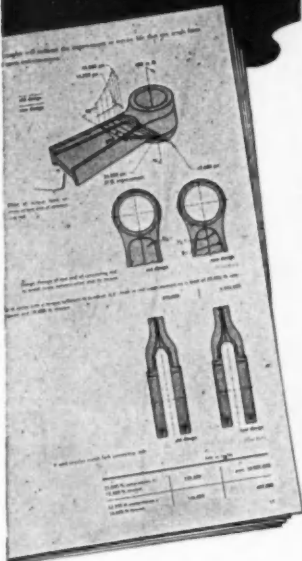


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How to avoid the localized stresses which start failure is a basic problem of design. This 72 page booklet analyzes many good and bad features of design. It also deals with problems of steel selection and treatment from the viewpoint of the design engineer—instead of the metallurgist.

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AL-11

Ceramic Coatings

(Continued from page 50)

Observation and experience in the Ryan Development Laboratories have shown that much of the deterioration of unprotected headers has been due to the high rates of carbon absorption with resultant surface embrittlement. The ceramic coating prevents this carbon absorption, eliminates oxidation and inhibits corrosion attack—thus greatly extending the service life of such component parts.

To test the thermal shock characteristics of the ceramic coatings, coated headers were heated to 1700 F and quickly cooled to -70 F. Handling time was kept to 10 sec. Specimens from each run were dropped six ft to a concrete floor to check for hot and cold impact results. After all test runs there were no cracks, chips or other damage to the ceramic coatings. This is an important advantage in this application because such durability makes it possible to align the exhaust sections in precision jigs with torches and rubber mallets without chipping or crazing the ceramic coatings.

Ryan is the only aircraft company in the nation providing ceramic coated parts for aircraft use on a production basis. The entire fleet of Boeing 377 Stratocruisers is being re-equipped with ceramic coated headers as replacements are made as a result of the tests conducted by Ryan. These giant airliners are in the services of Pan American World Airways, Northwest Airlines, United Air Lines, British Overseas Airways and the Military Air Transport Service.

Production orders for ceramic coated exhaust system components have also been received from Convair for the fleets of 340 airliners operated by American Airlines, Pan American and Western Air Lines as well as Continental, Northwest and Midcontinent. Similar ceramic coated siamese exhausts are on order for the new Convair Model 340 transport. Experimental orders have been received from Pratt & Whitney for fully ceramic coated manifolds for their latest series R-4360 engines which are used on the Boeing C-97 and B-50 aircraft and the Convair B-36 intercontinental bomber.

Experimental work is also being conducted with Douglas Aircraft Co. and United Air Lines on ceramic coating of DC-6 transport exhaust assemblies through service tests on actual scheduled runs.

On the ground, Continental Motors Corporation's 825 hp engine for the General Patton tank will have ceramic coated sections on the manifolds due to go into production soon at Ryan.

Ryan's pioneering work with ceramic coated exhaust systems goes back to World War II when comprehensive

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ELOX ELECTRON DRILLS* are now being used by the largest automotive firms, heavy and light manufacturing firms and divisions of the U. S. Army and Navy. *T.M. Reg.

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If you happen to run into any situation where you need metallurgical advice concerning defense orders, let us know about it. We will do our best to help. And you can rest assured that our advice will be given from

an unbiased viewpoint, for we manufacture practically all grades of steel and we have no special products that we are interested in promoting.

This service will cost you nothing; it may prove to be of considerable value.

If you need steel, remember that Bethlehem is a dependable source for all of the AISI alloy grades in addition to the full range of carbon and special steels. For full information, call or write our nearest sales office.

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TAP-LOK INSERTS

**prevent
thread stripping
in soft
materials**



The unique self-tapping feature of TAP-LOK INSERTS substantially reduces assembly costs in continuous production, by eliminating a separate tapping operation. This method of increasing the shear area of tapped threads in softer-than-steel materials is fast and economical, consisting of three easy steps:



①

A simple driving tool with a threaded stud engages the interior threads of the insert until its shoulder contacts the top of the insert.



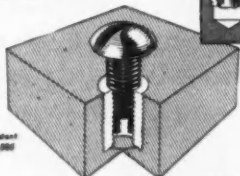
②

The driving tool then turns the insert into a cored or drilled hole equal in size to a tap drill hole for the insert's external thread. The insert cuts its own thread.



③

After the insert is seated, the male threaded member is driven into the interior thread of the insert.



U.S. Patent
2,435,885

Send for samples and descriptive folder.

Also manufacturers of Groov-Pins for positive locking press fit.



**GROOV-PIN
CORPORATION**

1119 Hendricks Causeway, Ridgefield, New Jersey

studies were made by the Laboratory to conserve vitally needed chromium and nickel supplies. From these investigations, a suitable ceramic coating was developed and applied to mild steel exhaust systems which were fabricated for 500 Douglas A-20 attack bombers. This alleviated the shortage of stainless steels and their critical ingredients. With horsepower rating zooming, Ryan is again employing ceramic research to find the means of meeting high temperature requirements for jet and piston engine uses.

Industry News

(Continued from page 76)

Reo Engineer Wins Detroit SAE Award

Ralph S. Parks, a member of the Reo engineering staff, is the first winner of the annual Henry Ford Memorial Award established by the Detroit section of SAE. His prize winning paper was on "Gas Turbines for Automotive Use." The \$200 award is given for the best paper presented by a junior SAE member.

More Ford Transmission Div. Details

Since publication of the article dealing with assembly operations at the Automatic Transmission Div., of Ford Motor Co., in Cincinnati (see Sept. 1, 1951, AUTOMOTIVE INDUSTRIES), the company has released some interesting details of the system for pressurizing and air conditioning the transmission assembly department. The transmission assembly area is roughly 16 by 68 by 360 ft and is completely air-conditioned.

All equipment required for this purpose is located above the ceiling on a reinforced concrete platform which is mounted in the roof trusses. The refrigerating and ventilating equipment is made in two separate and self-contained units, each one serving half of the assembly area. The two units are identical in size and are served by a Frick Co., nine-cyl vertical type refrigeration compressor using Freon 12 as the refrigerant. Component parts such as the condenser, receiver, and electrical controls, are all identical.

The central circulating fan system for heating and air-conditioning consists of an air mixing chamber, preheat steam coils, automatic self-cleaning oil type filters, refrigeration coils, steam reheat coils, and supply and return fans. Supply fans have sufficient capacity to provide a complete change of air every seven minutes. The system is adjusted and controlled to provide average conditions of 76 F dry bulb temperature and 64 F wet bulb, with a relative humidity of 52 per cent.

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With the right Cleveland, you are sure of getting utmost press efficiency. The new Cleveland Drum Type Clutch, available on Cleveland presses, is your further assurance of long-lived, economical, trouble-free operation.

A-1002

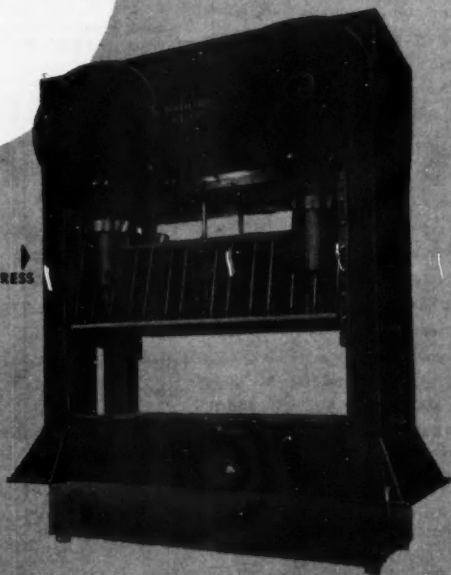


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FOUR POINT PRESS

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U.S.A.

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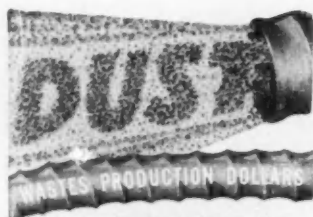
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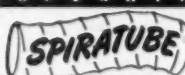
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Q-11



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PROD. NO.
PAT. 2,000

GUILFORD, CONNECTICUT, U. S. A.

Western Office: 414 Citizens Bank Bldg.
Pasadena 1, California

MEN in the NEWS

(Continued from page 25)

General Motors Corp., Cleveland Diesel Engine Div.—**Tom E. Hughes** was promoted to assistant general manager and **Roger D. Williams** general sales manager, the post formerly held by **Mr. Hughes**.

General Electric Co.—**John W. Belanger** and **Nicholas M. DuChemin** have been elected vice-presidents. **Mr. Belanger** has been appointed general manager of the company's newly-created Defense Products Div. **Mr. DuChemin** was recently placed in charge of the company's Manufacturing Services Div. **Sam Littlejohn** has been elected commercial vice-president. **Carl H. Rinne** has been named general manager of the Specialty Transformer and Ballast Dept. at Fort Wayne, Ind. The formation of six new operating divisions which together with the Defense Products Div., include the majority of the departments which constituted the former Large Apparatus Div. and Small Apparatus Div., with the following appointments has been announced: **Glenn B. Warren** as general manager of the Turbine Div.; **James M. Crawford**, general manager of the Motor and Generator Div.; **Francis E. Fairman, Jr.**,

general manager of the Transformer and Allied Products Div.; **George E. Burens**, general manager of the Switchgear and Control Div.; **Harold E. Strang**, general manager of the Measurements and Industrial Products Div.; and **William C. Wichman**, general manager of the Component Products Div. **C. Howard Black** has been appointed general manager of the Meter and Instrument Dept.

Eaton Manufacturing Co.—Three promotions have been announced: **F. I. Goodrich** is general manager of the Spring Div.; **E. H. Lindeman** becomes assistant general manager in charge of leaf springs; and **H. H. Clark** becomes assistant general manager in charge of coil springs.

General Motors Corp., Chevrolet Motor Div.—**John C. Moorhead** has been appointed plant manager of the Chevrolet-Detroit Forge Div.

The Cleveland Graphite Bronze Co., Engineering Div.—**Edwin Crankshaw** was named chief engineer for product and design; **Joseph Palsulich** and **Richard J. Schager**, assistant chief engineers; **Joseph F. Cerness**, chief metallurgist; **W. N. Goldenbogen**, chief chemist; **Wilbert H. Morrison**, assistant to the director of research; and **Harry Pochapsky**, chief electrochemist.

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S

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Metallic Aluminum-
Fused-Oxide Steel Asbestos
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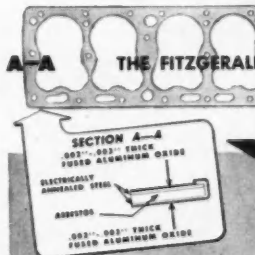
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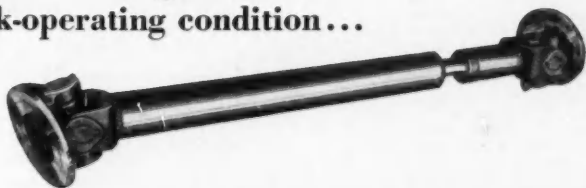
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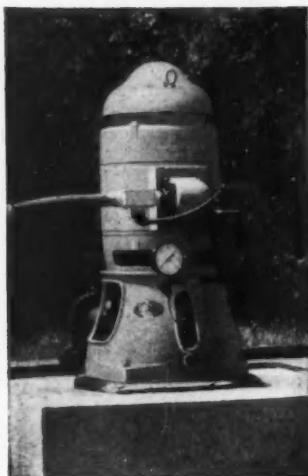
From northern Canada to the Argentine, the Cougar is right at home. Powerful and tenacious, he's adapted to all kinds of climate and terrain. Adaptability is a characteristic of Blood Brothers Drive Assemblies, too. They're tough, long-lived and smooth-running. On grueling highway runs or heavy pulling on off-the-road jobs, they get the power through dependably. Whatever your problem in heavy duty power transmission through universal joints, call on Blood Brothers for engineering consultation.



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STATEMENT OF THE OWNERSHIP, MANAGEMENT, AND CIRCULATION REQUIRED BY THE ACT OF CONGRESS OF AUGUST 24, 1912, AS AMENDED BY THE ACTS OF MARCH 3, 1933, AND JULY 2, 1946 (Title 39, United States Code, Section 233)

OF AUTOMOTIVE INDUSTRIES, published semi-monthly at Philadelphia 39, Pa., for October 1, 1951.

1. The names and addresses of the publisher, editor, managing editor, and business managers are: Publisher, G. C. Buzby, East Sunset Ave., Chestnut Hill, Philadelphia 18, Pa. Editor, James R. Custer, 303-B Hampden Road, Upper Darby, Pa. Managing Editor, None. Business Manager, G. C. Buzby, East Sunset Ave., Chestnut Hill, Philadelphia 18, Pa.

2. The owner is: (If owned by a corporation, its name and address must be stated and also immediately thereunder the names and addresses of stockholders owning or holding 1 per cent or more of total amount of stock. If not owned by a corporation, the names and addresses of the individual owners must be given. If owned by a partnership or other unincorporated firm, its name and address, as well as that of each individual member, must be given.) Chilton Company, Chestnut & 50th Sts., Philadelphia 39, Pa.

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4. Paragraphs 2 and 3 include, in cases where the stockholder or security holder appears upon the books of the company as trustee or in any other fiduciary relation, the name of the person or corporation for whom such trustee is acting; also the statements in the two paragraphs show the affiant's full knowledge and belief as to the circumstances and conditions under which stockholders and security holders who do not appear upon the books of the company as trustees, hold stock and securities in a capacity other than that of a bona fide owner.

5. The average number of copies of each issue of this publication sold or distributed, through the mails or otherwise, to paid subscribers during the 12 months preceding the date shown above was: (This information is required from daily, weekly, semiweekly, and triweekly newspapers only.)

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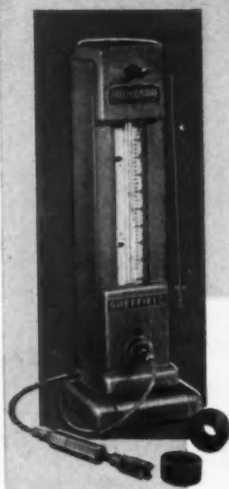
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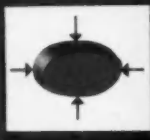
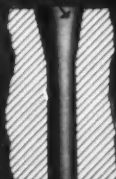
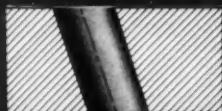
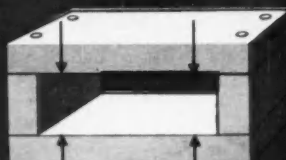
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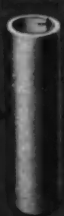
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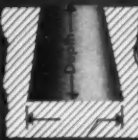
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Circle of round



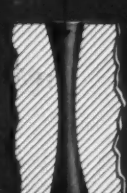
Work thickness or consistency and compare



Work thickness or consistency



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Gage



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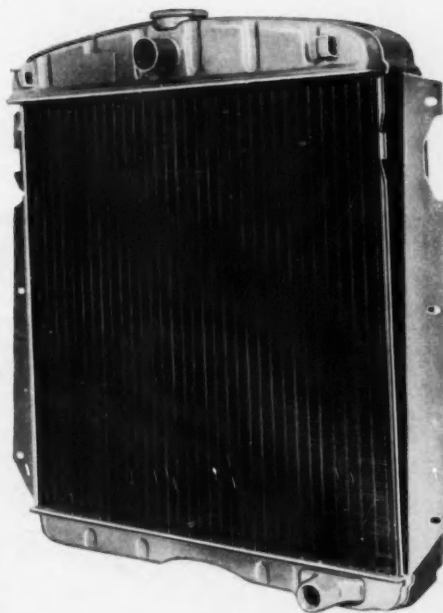
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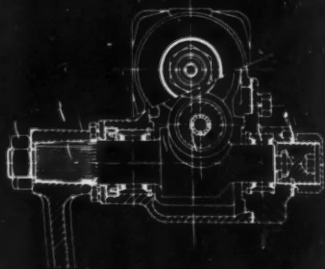
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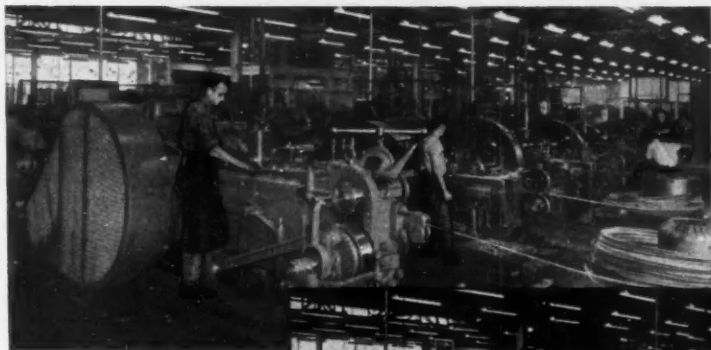


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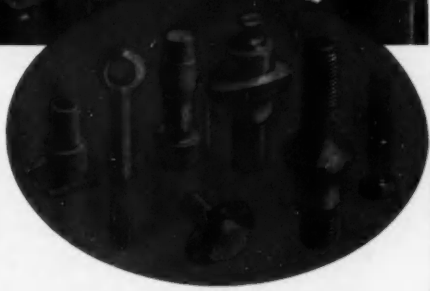
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PLANT 2
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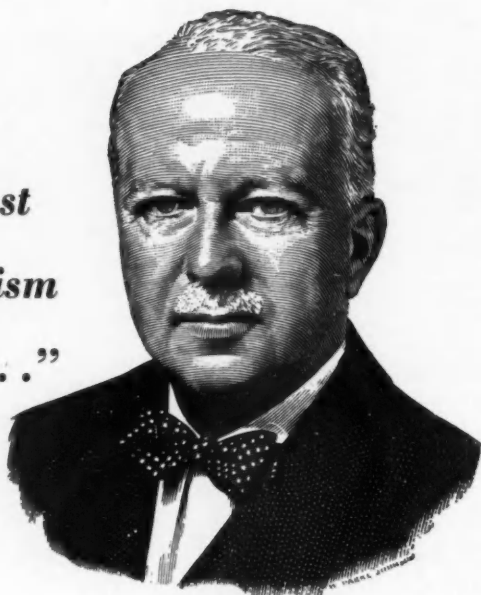


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PLANT 4
Hillsdale, Mich.

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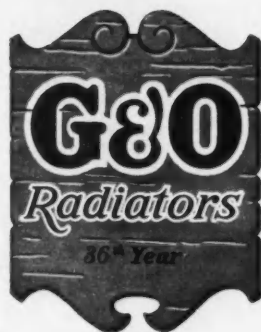
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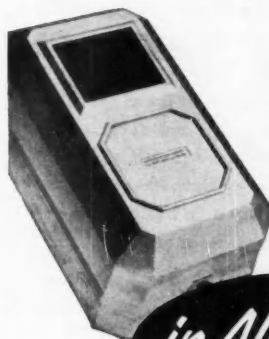


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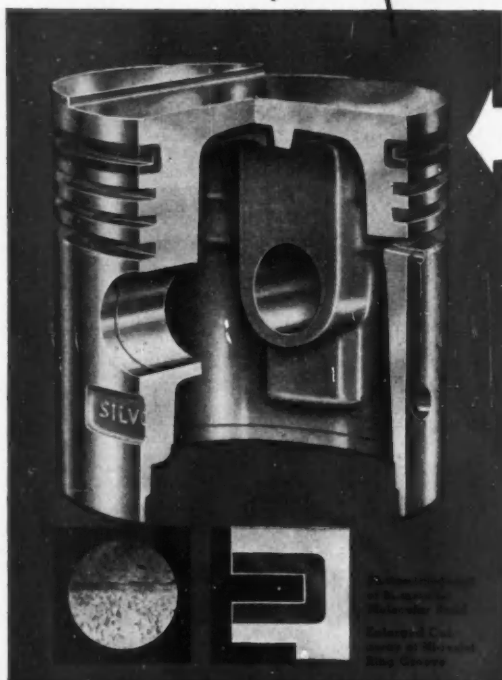
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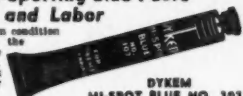
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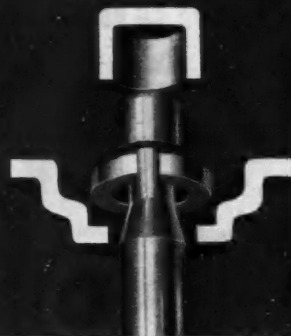


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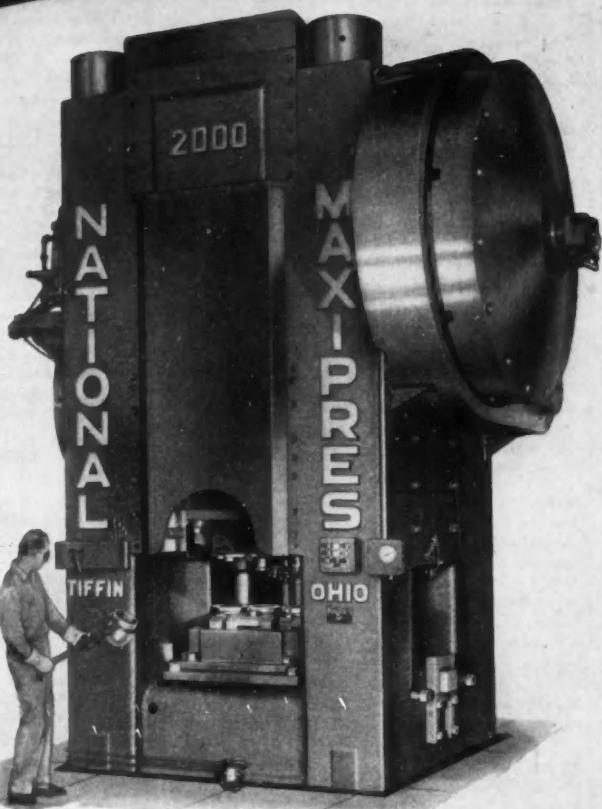
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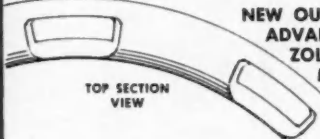
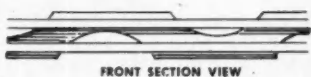
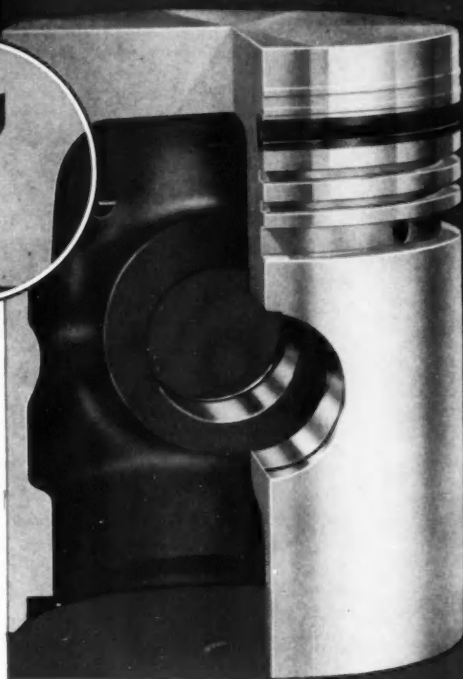
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DEVELOPMENT
by ZOLLNER

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METALLURGICALLY
Al-fin Bond

MECHANICALLY
Zollner Lock

Now, another great advancement in piston design is made available to engine builders by Zollner engineers. It's the new BONDOLOC Piston for heavy duty engines where excessive top ring groove wear has been a problem. A "Ni-resist" iron groove section is *permanently* incorporated in this piston by *both* Al-fin metallurgical and Zollner mechanical bond — *double bonded and locked* to positively prevent separation failure in any service. The exclusive Zollner mechanical lock with reverse angles on every surface joining "Ni-resist" iron and aluminum provides a multiple dovetail bond which is infinitely wedge-locked. Zollner engineers invite immediate discussion of the many advantages of BONDOLOC Pistons by application to your engine.

"BONDOLOC" Piston
FOR HEAVY DUTY ENGINES
THE EXCLUSIVE ZOLLNER
PISTONS



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MECHANICAL
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4. Increases surface areas carrying inertia load.
5. Provides visual inspection of bond as seen in ring groove.

Licensed under Patents 2,396,730; 2,455,457; 2,550,879.

*T.M. U.S. Pat. 2,550,879

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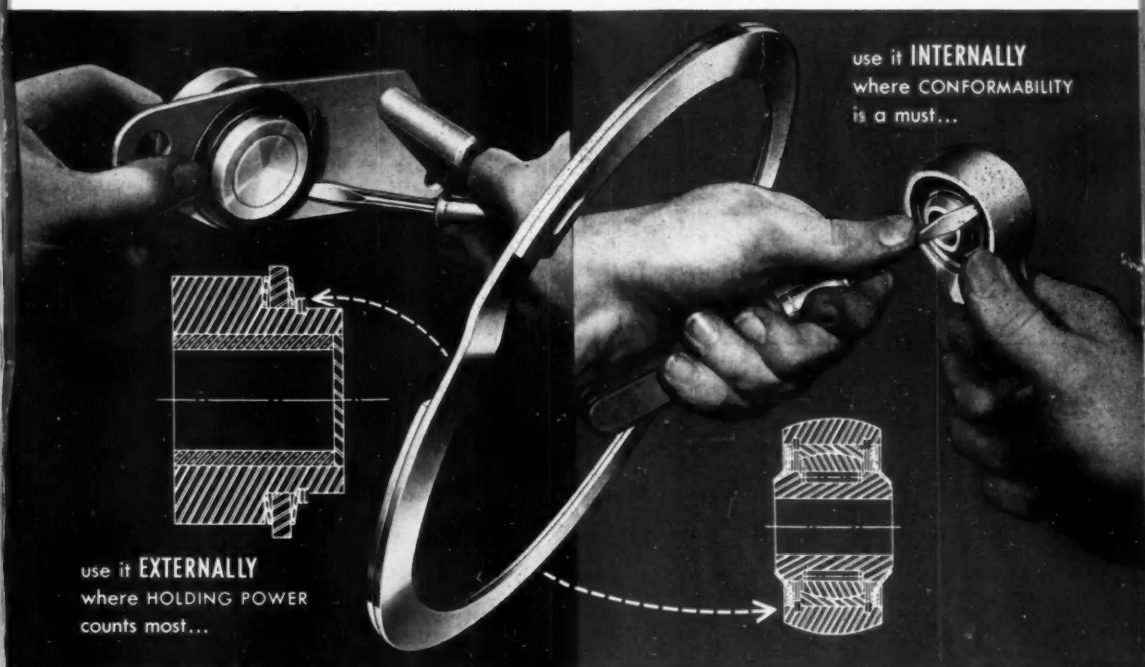
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ENGINEERING
• PRECISION
PRODUCTION
In Cooperation With
Engine Builders

there are hundreds of ways in which Industry uses **SPIROLOX** to solve retaining problems



use "easy-in, easy-out" **Spirolox** for compact design, removal of trouble-spots, elimination of costly machining and awkward parts!

The two application pictures above show how simply and effectively cylindrical parts assemblies are positioned and locked by Spirolox Retaining Rings in a toggle joint (right) and a friction clutch (left). Installed externally or internally, there's bearing surface all around... Spirolox conforms to the groove perfectly to resist centrifugal forces to a higher degree, and resist thrust forces up to its shear strength. In fact, because of its unique two-turn coil design, Spirolox will not jump the groove. Spirolox stays put because opening and closing force is resisted by friction created between the two turns. In operation, they are actually "squeezed" together to form a "friction lock!"

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FREE SPIROLOX SPECIFICATIONS CATALOG may help you build a product of greater simplicity and greater sales appeal, by eliminating awkward features and trouble spots. Your copy is waiting to point out how your retaining applications can be handled surer, quicker, more economically with SPIROLOX! Address request for your complimentary Spirolox Specifications Catalog to Ramsey Corporation, St. Louis 8, Mo.

Spirolox Retaining Rings are covered by United States Patent No. 2,450,425 and Foreign Patents. Other patents pending.

the better way

SpiroLOX

RETAINING RINGS

to hold moving parts TOGETHER!

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Flip! it's out

gapless • concentric • requires no special tools • easy-in,

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